The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 15 CHICAGO July 16, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager,
101 West 41st Street, New York City

A. S. Barnett
Western Representative

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

TABLE OF CONTENTS

FEATURE ARTICLES

Compact Sand-Gravel Plant 11, 12, 13, 14
A. Courchesne, El Paso, Texas, operates a novel sand and gravel plant, using as raw material a disintegrated dolomite.

Gravel for Gravel Roads 15
No. 4 of a series of articles on the sand and gravel deposits of New Hampshire.

Sand Settling and Sand-Settling Devices 16, 17
No. 4 of a series of articles—Classification—Use of hydraulic water.

Perfect Control of Dry Process Cement Manufacture 20, 27
Crushing plant of the Giant Portland Cement Co., Egypt, Pa.—System of bins and conveyors giving elastic control of proportioning of raw materials.

Practical Chemistry for Lime and Cement Manufacturers 28, 29
Lime mortar—Chemical uses of lime and limestone, calcium sulphate and plaster

Wet-Mortar Plants to Promote the Lime Industry 30, 31, 32, 33
"A chapter of successful experience," covering the history of the mixed mortar business of the United States and its tremendous success in California.

Eastern Portland Cement Manufacturers Sued by Federal Government 34
Open-price policy of association practices to be tested in United States Courts.

DEPARTMENTS

Hints for Superintendents 18, 19
"Systemize your work and work your system"—Erecting a large gyratory crusher—Support for hammer drills—Steam-shovel dipper-boom repairs.

Editorial Comment 35
A Sandles epitome—The railways vs. highways.

General News of the Markets 36, 37

Accident Prevention 38
Prevention of oiling hazards.

New Equipment and Machinery 39
Pulverized coal handling equipment—Use of compressed air.

Current Prices of Rock Products 40, 41, 42, 43

General News of All the Industries 44

For Index to Advertisements See Page 67

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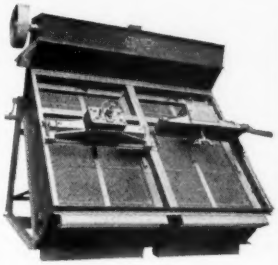
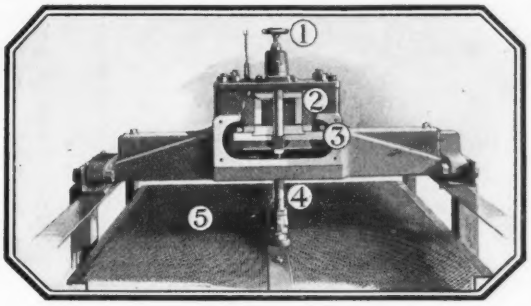
HUM-MER *Electric* SCREEN





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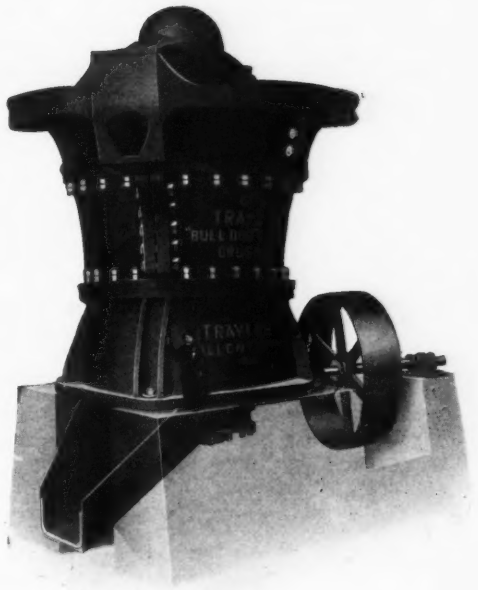
Self-Aligning Eccentric Journal Bearing

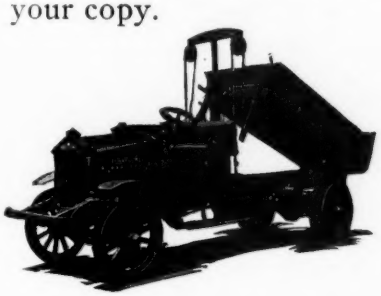
Traylor "Bulldog" Gyratory Crushers



The exclusive features enumerated above are only a part of the exceptional value you get with a "Bulldog" crusher.

The material we use, the careful attention to details of manufacture, and our policy of viewing every article we build as a factor not alone in the transaction in which it has a part, but in whatever future patronage we hope to enjoy — all have a certain bearing on the real value of this machine.

Bulletin RGX-1 tells the whole story — secure your copy.



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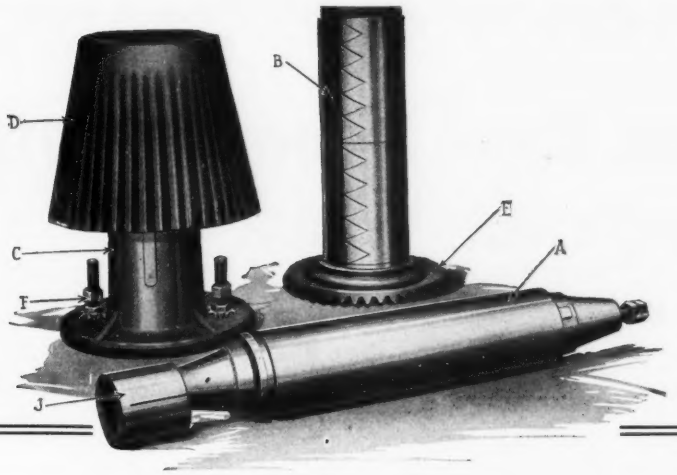

HOW TELSMITH WORKS

The parts shown above are the principal "insides" of the Telsmith Primary Breaker. A is the shaft, a huge, forged steel bolt—***rigid,*** not rotary or gyratory. B is the eccentric which turns about the shaft, being driven by gear E and a pinion which is not shown. C is the flanged head-liner and D is the head, adjusted by means of jack-screws F. The eccentric rotates inside the head; but neither head nor head-liner is rotated. They ***gyrate*** together —slide horizontally. This movement, equal at top and bottom of the head, is most effective for coarse crushing. The big chunks are pinched the minute they enter the bowl. There is very little slippage, even with smooth, hard river boulders.

It sums up to this: the big rock needs the maximum crushing stroke. Telsmith applies that long, horizontal pinch right at the strategic point. That's why Telsmith takes bigger rock and crushes more of it.

There are other features of Telsmith design that are just as interesting as the "parallel pinch"— for instance, the short, heavy structure, the massive, low-arched crown, the unbreakable shaft, the enormous crushing areas, the force-feed oiling system, the free bottom discharge. All these things are fully described in catalog No. 166 (Telsmith Primary Breaker) and bulletin No. 2-F-11 (Telsmith Reduction Crusher). Write for them.

SMITH ENGINEERING WORKS

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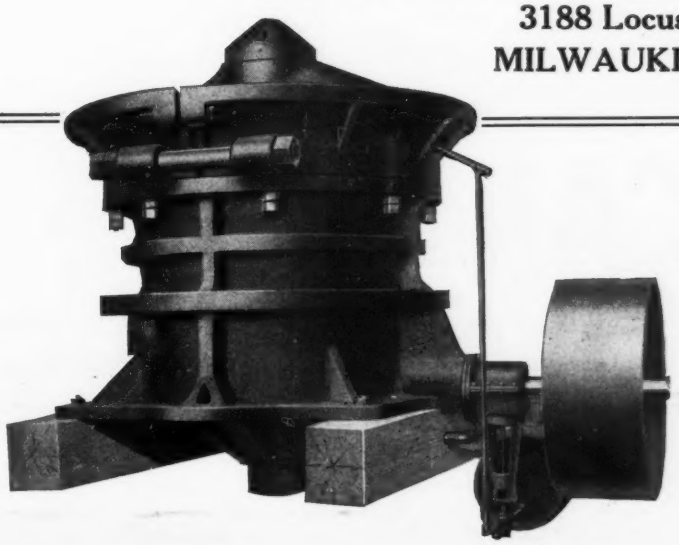

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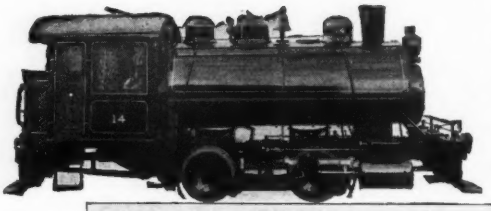
WEATHER conditions have a lot to do with contract profits, but the contractor that handled the job illustrated refused to let them beat him out.

The conditions were: heavy grades, one about 12 per cent; sharp curves, one limited the trains to two loaded cars; and working day shifts only, with half the time lost due to rain and moving up delays.

With these conditions against him, but with four 22-ton VULCAN Locomotives and thirty-three Western 8-yard air dump cars, 56,000 cubic yards were moved about 2000 feet in a single month. Such records do not permit of locomotive delays.



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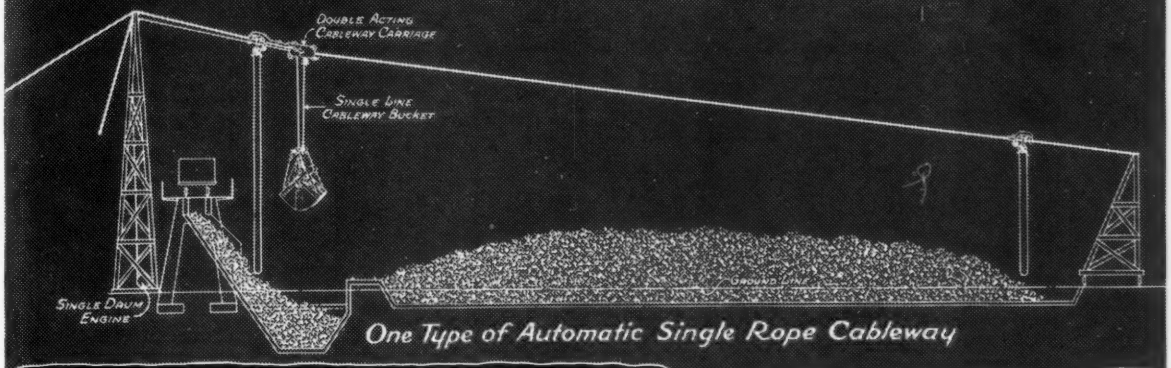
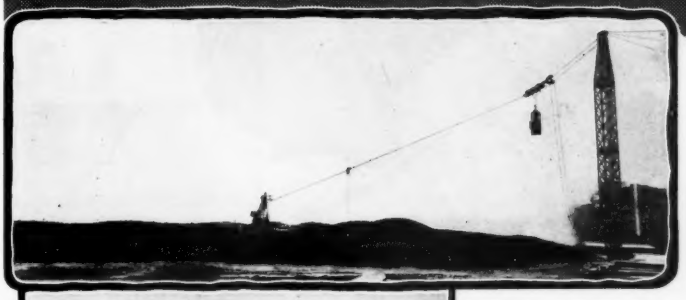
VULCAN LOCOMOTIVES

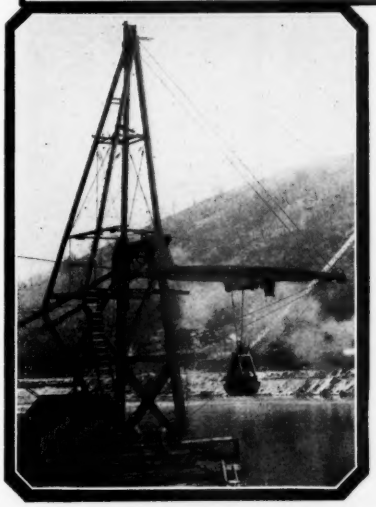
Clamshell Cableways

Single Rope - Automatic



One Type of Automatic Single Rope Cableway





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Equipped with a Blaw-Knox Single Line Bucket, this cableway can be operated by one man and will quickly and economically unload, transport, store and recover coal, sand and all kinds of loose bulk materials.

The clamshell digs into the material, picks up a big load, is hoisted and then conveyed along the cableway track—drops automatically and returns to the starting point for the next load—always under the control of the hoisting engineer.

Blaw-Knox cableways have solved many storage problems—an installation similar to any of those shown herewith is low in first cost and the consequent saving in time and labor will very quickly offset the initial investment.

Exisiting cableways can be equipped with an Automatic Single Rope Cableway Carriage and a Single Line Bucket without a change in the hoisting machinery—your present power equipment can be used.

When confronted with the problem of economically transporting and storing loose bulk material—call into consultation one of our engineers and get his ideas as to the proper equipment suited to your particular needs.

Write for details of the Blaw-Knox Automatic Single Rope Cableway

BLAW-KNOX COMPANY

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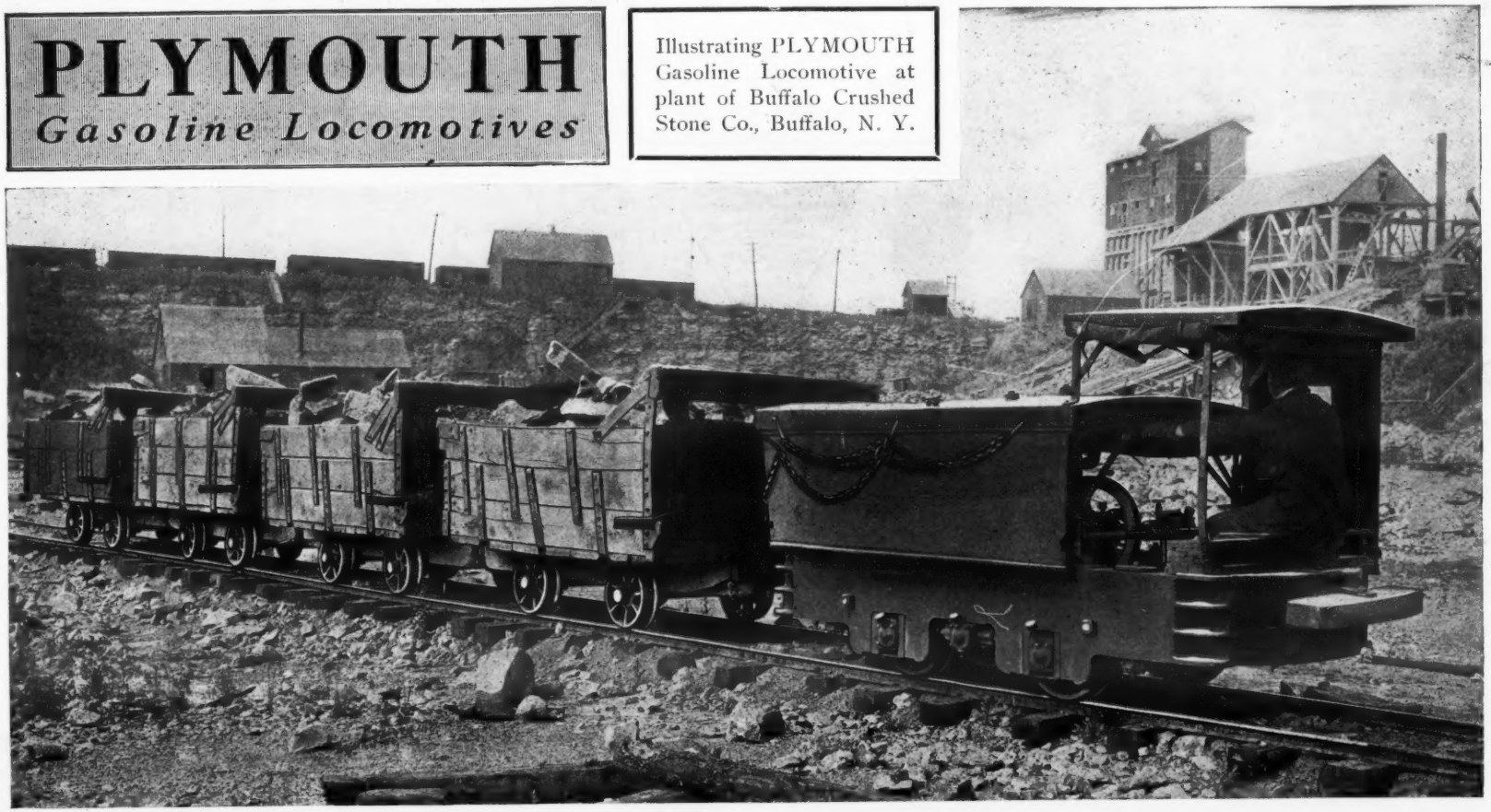
New York-Boston-Chicago-Detroit
Baltimore-Birmingham-San Francisco

PLYMOUTH
Gasoline Locomotives

Illustrating PLYMOUTH Gasoline Locomotive at plant of Buffalo Crushed Stone Co., Buffalo, N. Y.



Do you own a pit or quarry? Then consider the Plymouth Gasoline Locomotive. Power and endurance sturdily blended. It has pep and snap. Picks up the loaded train and hurries. Very low operating expense.

Releases man power, speeds production, cuts down overhead and increases profit. Built to work and behave. The Plymouth should sit in every conference where haulage is discussed. Ask for Special Bulletins.

THE FATE-ROOT HEATH CO., PLYMOUTH, OHIO, U. S. A.

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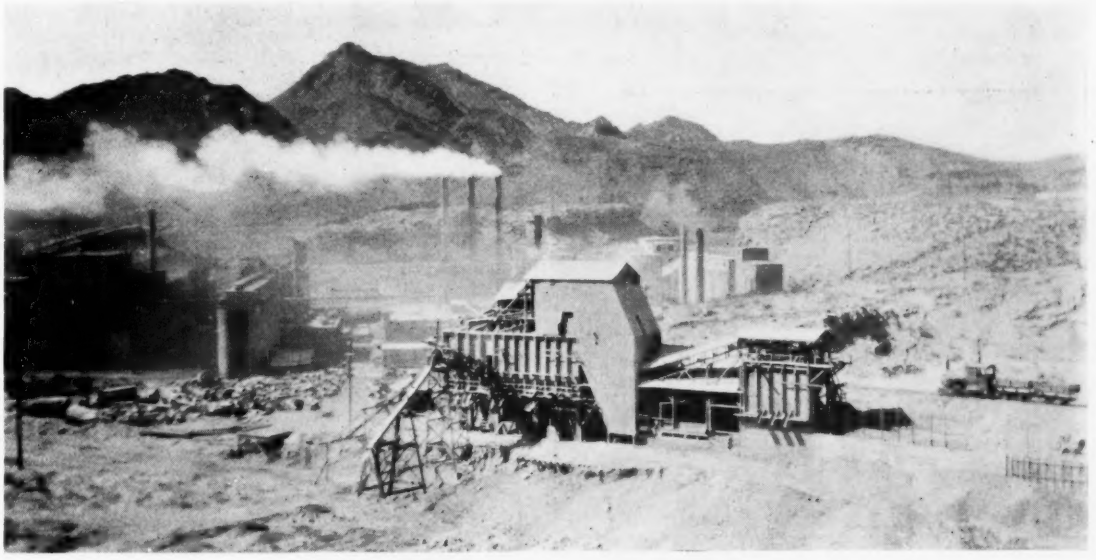
Rock Products

Vol. XXIV Chicago, July 16, 1921 No. 15

Compact Sand-Gravel Plant

A. Courchesne, El Paso, Texas, Operates Novel Sand and Gravel Plant—Details of and Interesting and Economical Operation

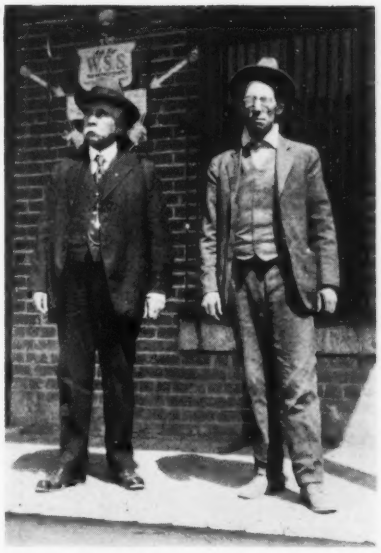
SAND AND GRAVEL OPERATIONS are not usually referred to as "mints," for the path of the sand and gravel operator is not always as rosy as it might seem to be, but anyone visiting the city of El Paso soon learns of A. Courchesne's "mint." Curiosity overtakes him and he gets a real desire to see this "mint." Upon satisfying his desire he finds the "mint" is only a sand and gravel plant, but nevertheless a "mint" when it comes to producing sand and gravel and producing it efficiently and economically.



General view of Courchesne gravel plant—Plant of the Southwestern Portland Cement Co. in the background

The sand and gravel deposit mined by this company is unique in that it is really a dolomitic limestone that has been weathered to such an extent that 25 per cent will easily pass through 4 mesh. The deposit consists of a wash formation that has been deposited in a canyon throughout the ages to the extent of some 5,000,000 yds. of material. The canyon is located on the west side of Mt. Franklin, about 4 miles from El Paso. Mt. Franklin is some 4500 ft. above sea level and contains enormous amounts of granite, dolomitic limestone and high calcium limestone.

The distance from the crushing plant to the pit is about 3,000 ft. at present, with a 1¾ per cent grade. The material is excavated by a small steam shovel with ⅞-cu. yd. dipper and deposited into 4-cu. yd. 36-in. gauge side-dump cars. The shovel is operated by two men, with an additional man in the pit to move the cars and do miscellaneous work. A light shovel works quickly and effectively, since the material is of such a nature that it requires no drilling or blasting. After the cars are loaded they are hauled to the plant by a 14-ton locomotive, whose crew consists of two men, an engineer and a brakeman. Thus with a force of 5 men, the company is able to bring to the plant 100 tons of material per hour.



A. Courchesne and A. M. Helpling

Arriving at the plant the cars are side-dumped over a 10x12-ft. grizzly. Fifty per cent of the material goes through the grizzly, the rest going direct to a No. 7½ gyratory crusher. The material going through the grizzly is conveyed by a short belt conveyor to a bucket elevator of 150 tons capacity, which also receives the material from the gyratory crusher and elevates it for passage through the sizing screen. From the sizing screen the materials are chuted to their respective bins, of which there are three; one bin holding material ¼ to ½-in., another

½ to 1-in., and the third ½ to 1½-in. The oversize is chuted to a fourth bin of 150 tons capacity, from which it is chuted to a No. 4 gyratory crusher, re-elevated, re-screened and distributed back to the bins.

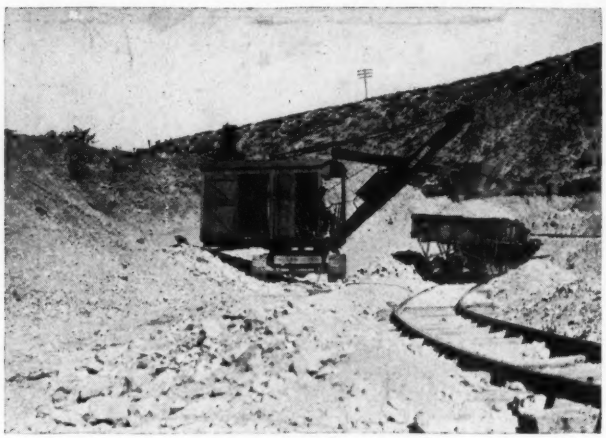
The material passing ¼-in. ring is chuted to a bin of 75 tons capacity, from which it is distributed on a belt conveyor and delivered to the sand washing plant, a distance of 78 ft. At the sand department the material is discharged into a puddling machine, which consists of a cylinder, semi-enclosed, with 24 paddles on it, there being 12 right-hand and 12 left-hand paddles. Both series of paddles have a tendency to draw the material toward the center of the cylinder. (Both water and sand enter outer edges of the cylinder.) As the material is pushed toward the center the adhering particles of clay and dirt are washed away and the product is discharged from the puddling machine free from any impurities. The puddler is

Character of deposit

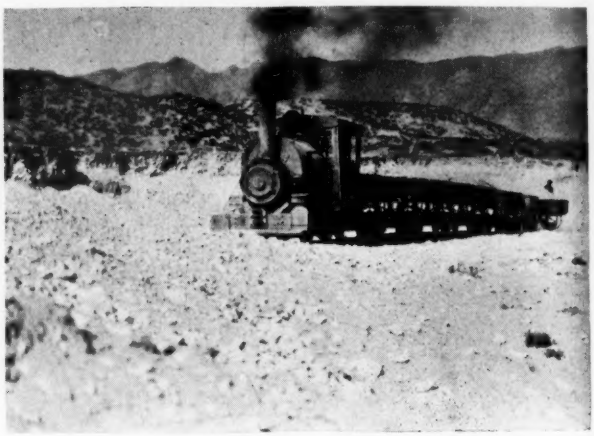
Enough space is provided for the storage of 15 cars. The cars are moved by gravity to a chute leading directly from the belt conveyor to car. Only 30 minutes is required to load a 50-ton car with this arrangement.

At the time of the writer's visit the company had under design a ground storage to be located directly above the loading tracks. The ground storage was to be in the form of a concrete tunnel, 275 ft. long and high enough to accommodate a gondola car. The material is deposited over the tunnel by a belt conveyor equipped with trippers so that the stone can be stored with respect to the various sizes. The conveyor will run parallel to tracks and about 50 ft. above ground level. Thus the company will be able to have a ground storage of from 15,000 to 18,000 tons of stone.

The plant is electrically operated, using 440-v., 60-cycle, 3-phase current. The entire plant requires only 157 h.p. for operation; 75 h.p. for initial crusher, 30 h.p. for main elevator, 35 h.p. for secondary crushing plant, consisting of crusher,



Steam shovel loading

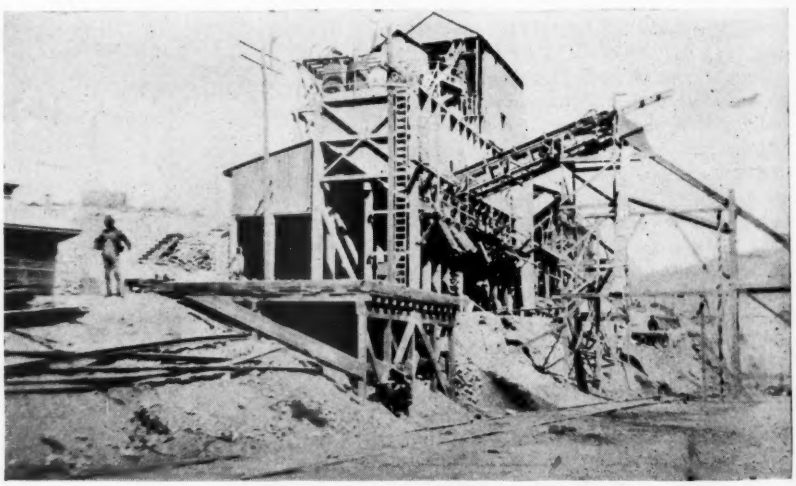


Hauling to crusher

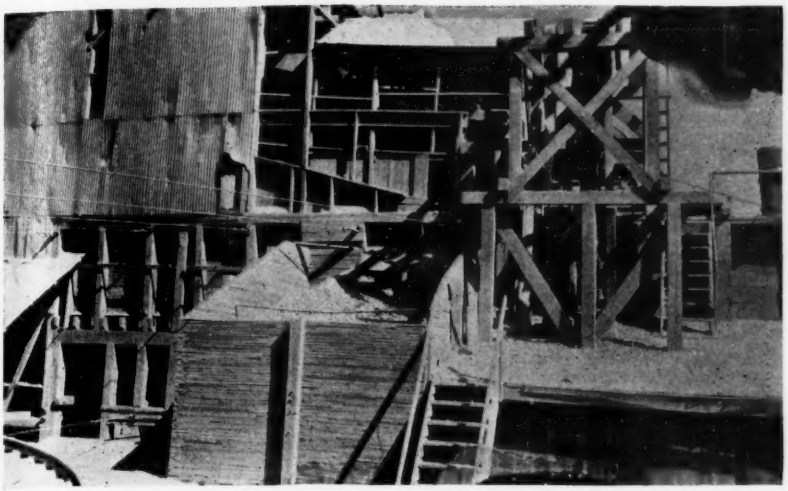
of the company's own design and manufacture and requires only 2 h.p. to operate. The cylinder is 5 ft. long, 20 in. in diameter, running at 120 r.p.m. This machine has been in operation for nearly a year and has required no repairs whatsoever during that period.

The puddler after thoroughly mixing the sand and water discharges directly into a double screw type classifier, which discharges the sand into a bin, while the clay and other foreign matter is flumed off to the settling pond. The sand bin is directly underneath the washer and has a capacity of 75 yds.

The material from the bins is either loaded to motor trucks, of which the company has a fleet of eight, or to cars for rail shipment. The car loading scheme is of rather a unique nature. A 24-in. belt conveyor has been placed between the bins and an arrangement has been made leading to the bins so that the conveyor can receive material from any one or any combination of bins to make up any desired size aggregate. The two loading tracks and a spur from the Santa Fe R. R. are situated 70 ft. from the plant.



Belt conveyors and loading spouts

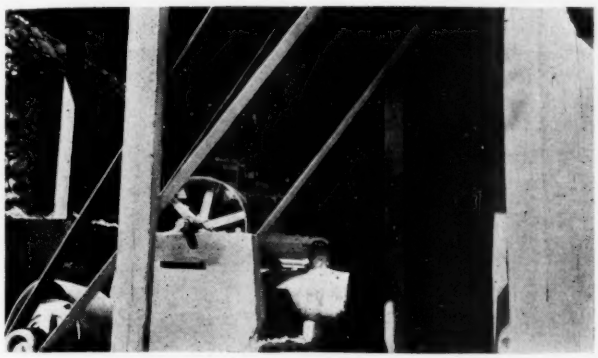


Main elevator and sizing screen

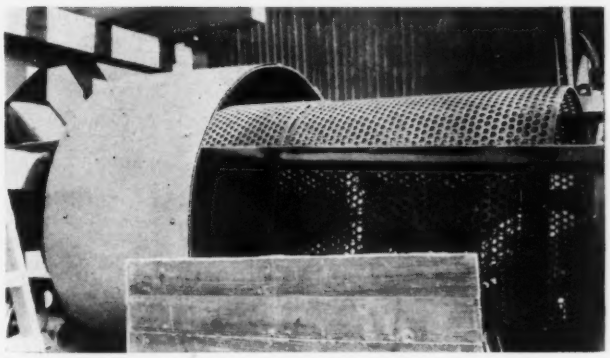
elevator and screens and 7 h.p. for the sand-washing plant. A 10-h.p. motor is used for a 2½-in. centrifugal pump that supplies water to the puddler. Under an actual test the company found that for every ton of material produced, only 1 k.w. of electricity was consumed. This is due in great part to the fact that a very large percentage of the gravel is not even passed through the crushers.

The crushing plant was originally designed about 16 years ago, not as a commercial rock crushing plant, but to supply the demand for lime flux for a smelter in the vicinity. The demand fell off, however, in the course of a few years and the plant was abandoned. As time went on, a demand arose for commercial crushed stone and the company then remodeled the plant for this purpose.

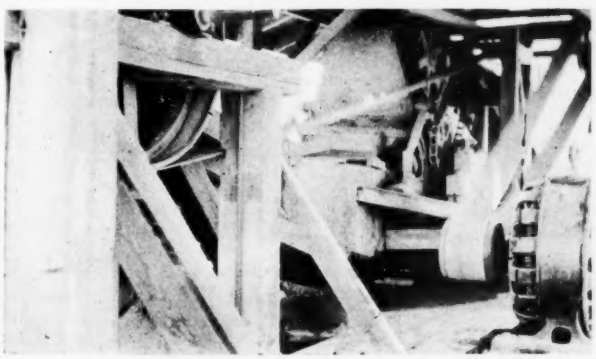
That the company operates economically is well evidenced by the fact that it



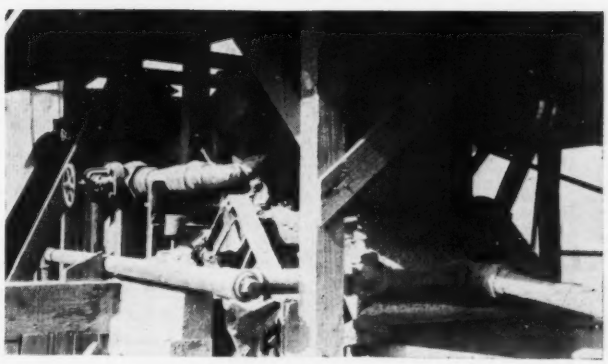
The No. 4 gyratory crusher and bucket elevator



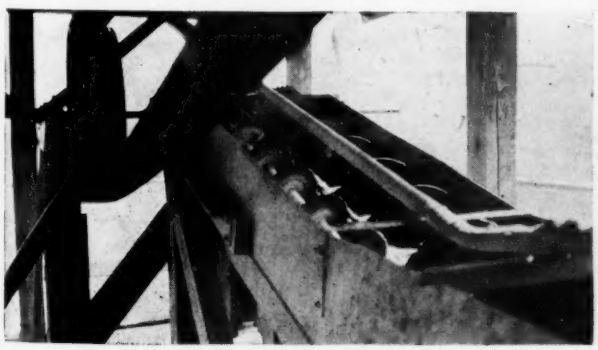
Screen in re-crushing plant



View of puddler showing drive

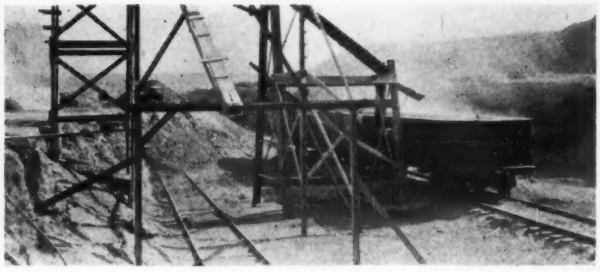


Puddler showing water mains



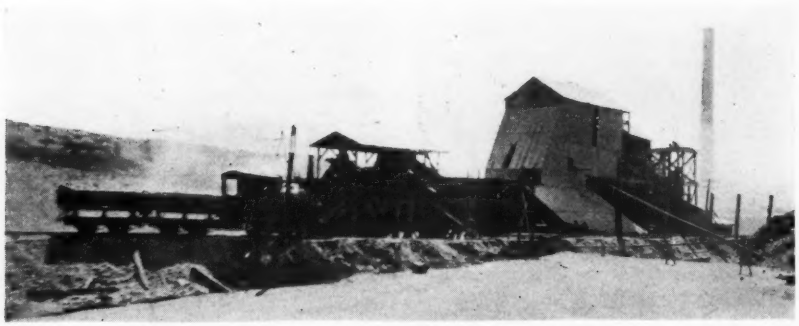
View of screw washer

The 10x12-ft. grizzly with 2-in. openings

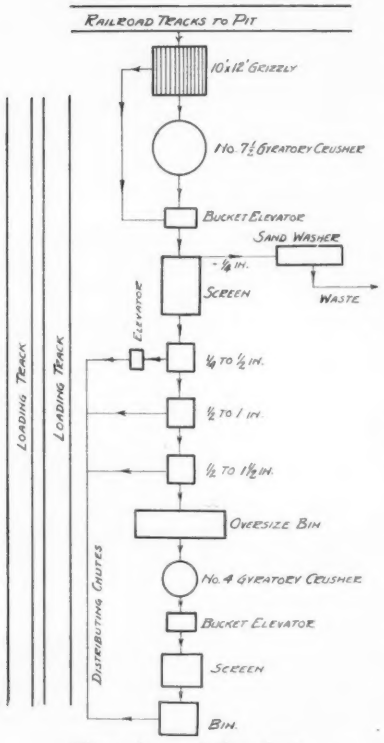


Loading gondola cars

Loading motor trucks



View of plant showing railroad entrance from pit



Flow sheet of the plant

has a capacity of 500 tons of aggregate per day and only requires a force of nine men. Of the nine men only one is a skilled man, the rest being Mexican day labor.

The president of the company is A. Courchesne and his son T. A. Courchesne is vice-president and general manager. A. M. Helpling is superintendent and engineer. Mr. Helpling is a mining and milling man and has incorporated many of his ideas in this plant. He believes that rock crushing is a science and should be operated in a scientific way.

Rates on Gypsum Tile Must Not Be Higher Than on Clay Tile

ASSISTANT CHIEF EXAMINER ULYSSES BUTLER, of the Interstate Commerce Commission, in a report on further hearing on No. 8297, Acme Cement Plaster Co. vs. Akron, Canton & Youngstown, Director-General, et al., has recommended a holding that there is no such difference in the characteristics of transportation of gypsum hollow partition tile and clay hollow building tile as to warrant the difference in the basis of rates throughout central territory. He said the Commission should hold that the present rates on gypsum partition tile from Grand Rapids, Mich., to points on and east of the Mississippi River and north of the Ohio River as far east as the eastern boundary of central territory are unduly prejudicial to complainants and their traffic, and unduly preferential to shippers of clay tile within that territory and their traffic; and that non-prejudicial interstate rates on gypsum partition tile from Grand Rapids to destinations in the territory under consideration should not exceed 11.5 cents for distances of from 300 to 325 miles, with gradations of half a cent for each 25 miles additional or lesser distance, increased as authorized in Ex Parte 74, with minima equal to those on clay tile.

Butler said that this series of findings should be without prejudice to any conclusions the Commission might reach as to rates on clay tile in No. 10733, National Paving Brick Manufacturers' Ass'n et al. vs. Alabama & Vicksburg et al.

This report also covers No. 8386, American Cement Plaster Co. vs. Michigan Central et al. It is an addition to the report published in 47 I. C. C. 1, and 53 I. C. C. 46. In its first report the Commission found there was no such difference in value, risk of carriage, weight or other incident of transportation as to warrant a rate on gypsum tile higher than rate on clay tile. In obedience to that finding, the carriers, in January, 1918, submitted a schedule for application on gypsum tile to which the complainants made vigorous objection. The complainants asked the Commission to prescribe specific rates, but it declined. The cases, however, were reopened for further hearing to determine the relationship in rates which should be established.

In the second report, April 14, 1919, the Commission again said that rates on gypsum tile from Grand Rapids should be no greater than those contemporaneously maintained on clay tile. No method for removing the undue prejudice was prescribed, but the carriers were given 60 days in which to effect a readjustment. Complainants objected to the tariffs that were filed, thereby creating the present case, and if the Commission adopts Butler's report, it will be doing what it declined to do in 1918, namely, prescribing specific rates.

Notwithstanding the fact that specific rates were recommended by Butler, he did not recommend an order directing the carriers to put the suggested rates in effect. The carriers, however, are expected to follow the Commission's suggestion.—*"Traffic World."*

Railways Reduce Bedford Limestone Rates

THE RAILWAYS have been authorized by the Interstate Commerce Commission to file schedules on a fifteen-day notice reducing by about 20 per cent rates on building stone from the Bedford, Ind., district to points east of the Mississippi and north of Ohio.

Gravel for Gravel Roads

No. 4—Geology of Sand and Gravel Formations and Why Some Gravels Are Better for Gravel Roads Than Others

FAN GRAVELS—Fans spread out by streams descending from steep valleys to flat plains occur rarely in this State except among the White Mountains. It seems likely that these deposits were largely built immediately after the retreat of the ice sheet, when mountain sides were cluttered with loose glacial drift, as yet poorly protected by vegetation, and when rainfall was perhaps heavier than now. Some of these old fans are still receiving additions, when fed by cloudbursts or freshets or slides down the old paths. Such fans may thus afford much harder road material than the banks of glacial drift, whose gravel mixtures consist of weaker types of rock. So far as the fans are of later origin, also, their gravels are fresher and harder than those of the glacial deposits.

Drumlin or "whaleback" composed of till—North Hampton, N. H.

Moraine Bank Gravels—Near the coast, where the sea formerly covered the land, sands and gravels were heaped up against the melting ice border, forming deposits which combine the characteristics of wash-plains with those of glacial moraines. These may be called "moraine banks."

From the hummocky backbone of a moraine bank, deposits of sand spread southeastward a hundred yards or more, like an apron. The surface seems to have been washed by the waves; for the altitude in each case seems to be a little lower than that of raised beaches in the same neighborhood. The ice contact affords the most gravel; and the plain, where not wholly sand, becomes more and more sandy toward its forward margin.

Raised Beach Gravels—Wave action during the stage of submergence appears to have been too feeble to make strong beaches of Hampton and Rye. Perhaps the coast was steadily rising as the ice sheet retired from it, allowing the waves little time in which to perfect their work at any level until emergence ceased; or perhaps shore ice protected the coast from attack by the sea. While the ancient beaches, then, are small and fragmentary, as compared with those of today, they include some which have perfect outlines and are situated at just the places where such beaches would form today, were the sea back at its old level.

Road Building Qualities of New Hampshire Gravels

Causes for Variation in Quality—Gravel for use on a road surface should contain stones strong enough to support traffic, and yet should have the ability to pack down and cement itself into a solid mass. Both physical and chemical properties are involved in these requirements.

Durability depends in the first place upon the presence of a fair *amount of coarse aggregate*—that is, stones between a quarter inch and two inches in short diameter. Such stones will support a heavier load than smaller stones or sand. Any gravel in which sand constitutes over 30 per cent of the mixture is best regarded as unfit for use in the surface course, because it will tend to act as a soft cushion through which the stones are pressed. Durability depends directly, also, upon the *strength of the stones* which compose the mixture. Pebbles of trap, quartzite, felsite, and hard crystalline schists are much more resistant to wear, and much tougher than stones of slate or granulated schists or the more crumbly types of granite. A very good judgment of the strength of a gravel may be formed, in the field, by making a count

Rain-washed exposure of "hardpan" near Andover, N. H.

of the number of stones of each type in the mixture. Such "percentage counts" have been made for all samples taken for the laboratory. Ability to "stand up" under traffic is governed to some extent by the *grading of sizes* in the mixture. The ideal gravel is one in which all sizes within the specified limits occur, in such proportion that the voids are reduced to a minimum, those between the larger pebbles being occupied by pebbles next in size, and so on down to the sand grains. Such a mixture would obviously suffer less rearrangement in the packing process than one in which pebbles of middle size are scarce or absent, so that voids in the coarse aggregate are occupied only by sand or clay.

(To be concluded)

Sand Settling and Sand-Settling Devices

No. 4—Classification—Use of Hydraulic Water

By Edmund Shaw
Allen Cone Co., El Paso, Tex.

SO FAR we have concerned ourselves with the mere recovery of one settled product. But the laws of settling have another and very important application in the separation of sand, or other like granular material into two or more sizes. This is technically known as "Classification."

Any type of settling device may be used as a classifier. In the first of these articles it was shown how a settler could be figured to settle all the sand coarser than 100 mesh, and that we could as easily figure a settler for 50 mesh, or 20 mesh or any other grain size. By placing such settlers in series, each having the proper area, we may obtain a series of settled products running from coarse to fine.

Figure IV shows such a series in a form considerably used a few years ago in Western concentrating mills. Each unit of the series is a tall tank having vertical sides. The diameters increase in the direction of the current flow, so that the largest size falls out in the first and the smallest size in the last. Hopper bottoms and drain-off pipes are provided for the removal of the settled material. While such arrangements are efficient enough, they have been discarded because of the floor space and headroom that they require.

Surface current settlers may also be used in series, and such an arrangement used to be a standard part of mills treating copper, lead and zinc ores. It was employed especially in the classification of the finer sizes of sands.

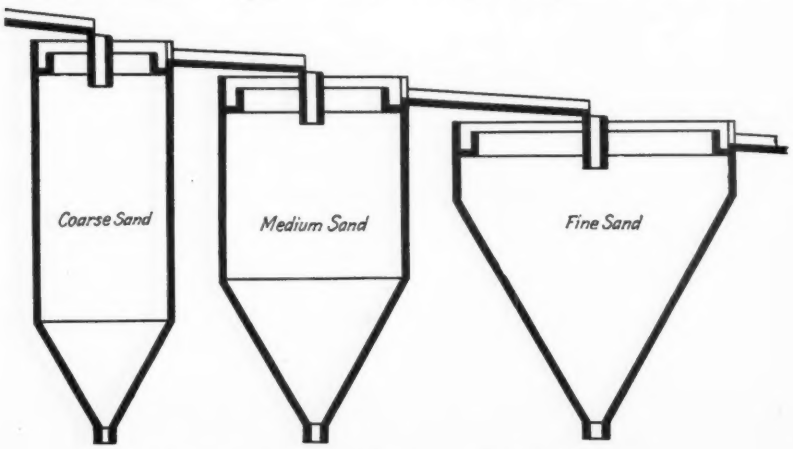


Fig. 4—Series of settling devices used as a classifier

Hydraulic Classifiers

Whole current and surface current devices are primarily settlers. We now come to another class of machines which are primarily classifiers, or separators, and which have a further distinguishing feature, in that they use water from another source than the feed stream to aid or complete the separation. These devices are known as Hydraulic Classifiers, and the water admitted from an outside source is known as hydraulic water. Two types are recognized, "free" and "hindered" settling classifiers, but only the free settling devices will be considered now.

There is a bewildering number of forms of this machine, for the sight of one seems to afflict the beholder with what alienists call the "delusion of compulsion." He feels compelled to go out and invent a new machine of that type himself. So there are pages of different forms in the books, and ore mills throughout the West and elsewhere can each show its classifier, the pet device of some mill foreman or superintendent, often designed in cheerful ignorance of the primary laws of settling.

Tubular Classifiers

From this assortment of machines we have chosen to describe one of the oldest and simplest forms, but one which applies the laws of settling in a sensible fashion. Richards calls this class of machines Tubular Classifiers. A simple form is illustrated in Figure V.

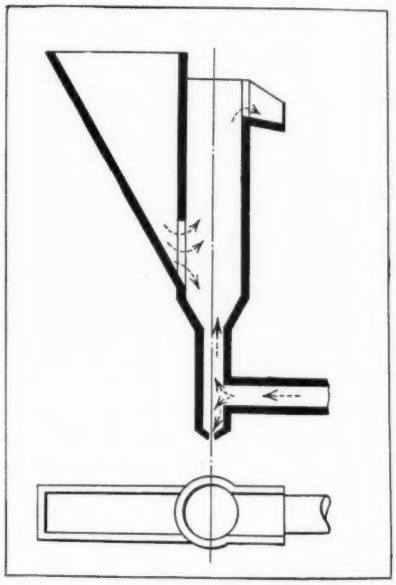


Fig. 5—Simple tubular classifier

The main portion of this machine is a vertical tube with an overflow lip at the top which discharges the fines and the surplus water. The feed is brought in through the inclined pipe at the side and the settled product is taken off at the bottom through a pipe nipple. This pipe nipple, or some equivalent, is called the spigot.

Between the spigot and the large tube which forms the body of the classifier is a "Tee" and a vertical piece of pipe. This piece of pipe is called a Sorting Column or Sorting Tube and is the essential part of the

machine. The line entering the "Tee" from the side brings in clear water, which does the work in the sorting column.

To explain the operation of the device: The feed flows down the inclined feed spout into the large tube. We will suppose that no hydraulic water is being admitted through the "Tee' for a moment. The feed on reaching the main tube will divide. The spigot is not large enough to take all of it, so a part must flow up and out of the overflow. This will create a rising current in the tube lifting those grains which have a lower falling rate than the upward velocity of the current. The particles too heavy to be lifted by this current will fall and pass out of the spigot. Thus there will be a classification, a separation of the solids entering the feed into two sizes, those which are light enough to go out with the overflow and those which are not light enough, and which therefore pass out of the spigot.

But this separation will be rough and incomplete. A great deal of fine material that ought to go out with the overflow will go down to the spigot with these heavy grains, for there is a downward current below the point where the feed enters, and any particle large or small that is caught in this current is bound to pass out of the spigot.

Use of Hydraulic Water

Here is where the use of the hydraulic water comes in. Let us suppose now that the hydraulic water is turned in through the "Tee." This water will divide into a rising and a falling current as shown by the arrows in Fig. V, since the area of the spigot opening is not sufficient to pass the whole of it. Hence there will be a rising current of clear water in the sorting column. This upward current of clear water will send the fine particles and clayey water back into the main tube and there they will be caught by the upward current from the feed stream and sent out with the overflow product to which they really belong.

In this way the rising current in the sorting columns will finish the work begun in the tube above and a very perfect classification will result.

If the device has the correct proportion in every part, the rising current in the main tube and the rising current in the sorting column will be the same and theoretically perfect classifier will have been designed.

All this is very fine in theory, and as a laboratory device the rock of the tubular classifier leaves little to be desired. But as a working machine operating under every day conditions it is far from perfect.

To do perfect work the machine must have an absolutely constant feed both of solids and water and this is something that is never found in any plant. If too much water comes in with the feed too strong a current will be set up in the main tube and particles will overflow that should go to the spigot. A variation in the solids will have an equally bad effect. If there is an excess of heavy particles, the spigot will be crowded in the effort to discharge them. More hydraulic water will be forced upwardly through the sorting column increasing the velocity of the rising current, and particles which ought to go down to the spigot will be forced up to the overflow current. If the feed of heavy particles lightens, the spigot will be wide open and too much hydraulic water will pass out, and hence there will be a lessened rising current in the sorting column. Then a lot of fine particles that ought to go to the overflow will fall through the sorting column and pass out of the spigot. Hence the work of the device will vary with every fluctuation in the feed and the most that can be hoped for in a commercial machine under working conditions is a fairly good *average* result.

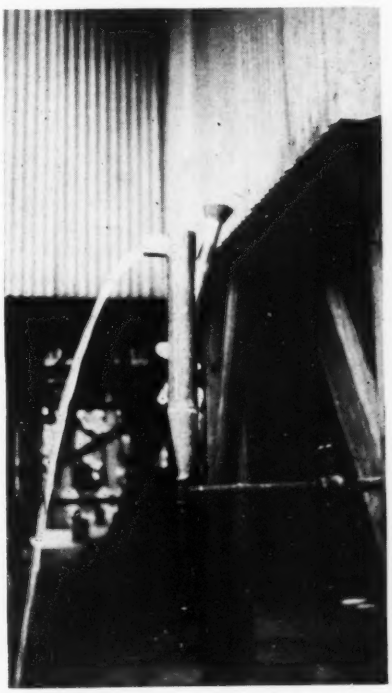


Fig. 6—Laboratory tubular classifier

As hydraulic classifiers have the further disadvantage of introducing a lot of fresh water into the plant, in addition to the faults just stated, they have been declared to be rather a nuisance and their place has largely been taken by some of the better forms of settlers in series where more than two products are required. But in special cases, when it is necessary to clean the settled sands of the last traces of clay, the use of hydraulic water has proven thoroughly efficient and practical, and forms of the hydraulic classifier have been devised which overcome in a large measure the objectional features of the older forms.

The use of a tubular classifier as a laboratory device has been mentioned, and Fig. VI is a photograph of such a laboratory machine. As the material was fed into it in a dry state, some changes from the form shown in the diagram have been made.

Such a device has been found very useful by the writer to check up calculations of settling area in field work, and also for securing experimental data in such matters as the washing of phosphate and other sands and the separation of two materials of different specific gravities.

(To be continued)

The Log of a Crushed Stone Company, or the Vicissitudes from Being a Quarry Man

AKANSAS CITY, MO., quarry company, the Lyle Rock Co., has experienced the following trials and tribulations, according to a local newspaper:

November 20, 1918—Lyle Rock Co.'s permit to blast revoked after property owners object. Blasting continues without permit.

August 1, 1919—Company ordered to remove buildings from center of Baltimore Avenue between Forty-Ninth Street and Brookside Boulevard. Refused.

December 6—Order repeated. Street commissioner ordered to remove buildings.

January 6, 1920—Company asks injunction to stop removal.

January 19—Judge T. J. Seehorn temporarily restrains city from removing buildings or pressing charges of blasting without permit.

June 9—Company barred from receiving city paving contracts.

June 23—Case heard before Judge Daniel E. Bird.

August 4—Restraining order modified by Judge Bird to prevent blasting on Baltimore Avenue. City permitted to prosecute for blasting without license.

August 5—Judge Bird dissolves injunction. Apparent victory for city and property owners.

August 6—Company notified to vacate Baltimore Avenue within 30 days.

August 8—Company asks new trial.

August 11—"Joker" in former ruling by Judge Bird appears. Motion for new trial is denied, but company is permitted to take case to State Supreme Court, which is about three years behind in docket. Allows temporary restraining order of Judge Seehorn to stand until case is heard there. Objections by city and property owners disregarded.

September 7—Company in South Side Court charged with blasting without permit.

September 11—Fined $25 in South Side Court.

December 10—Fine appealed.

March 15, 1921—Circuit Court sustains fine, opening way for trial of 61 similar cases pending against company.

March 25—Officials fail to appear for trial.

March 30—Company fined $50 on each of two counts. Judge Edward J. Fleming drops 59 additional counts. Fines appealed. Objections of property owners that if company is guilty on two it is guilty on all counts overruled.

Hints and Helps for Superintendents

"Systemize Your Work and Work Your System"

ORGANIZATION in a cement plant, or any plant for that matter, is just as important as organization in a bank or organization in municipal government.

The complex organization is based on the principle that its chief executive is its only executive and that all other employees are only assistants to him. In other words, the chief executive is the fellow who wields the big stick. All older business organizations were built on this principle.

As business grew larger the chief executive found that he could not possibly exercise all his executive powers, so it became necessary for him to delegate his powers to some of his subordinates. In this manner an organization was formed, where there was a head for each department.

This head was entirely responsible for everything that occurred in his department.

An organization of this sort has many good effects on the employees; the responsibility placed on the subordinates gives them a feeling of confidence and they immediately begin to use their own wits, solving problems which probably the chief executive could never do, since he cannot be as well acquainted with a particular department as a man who is working there day after day.

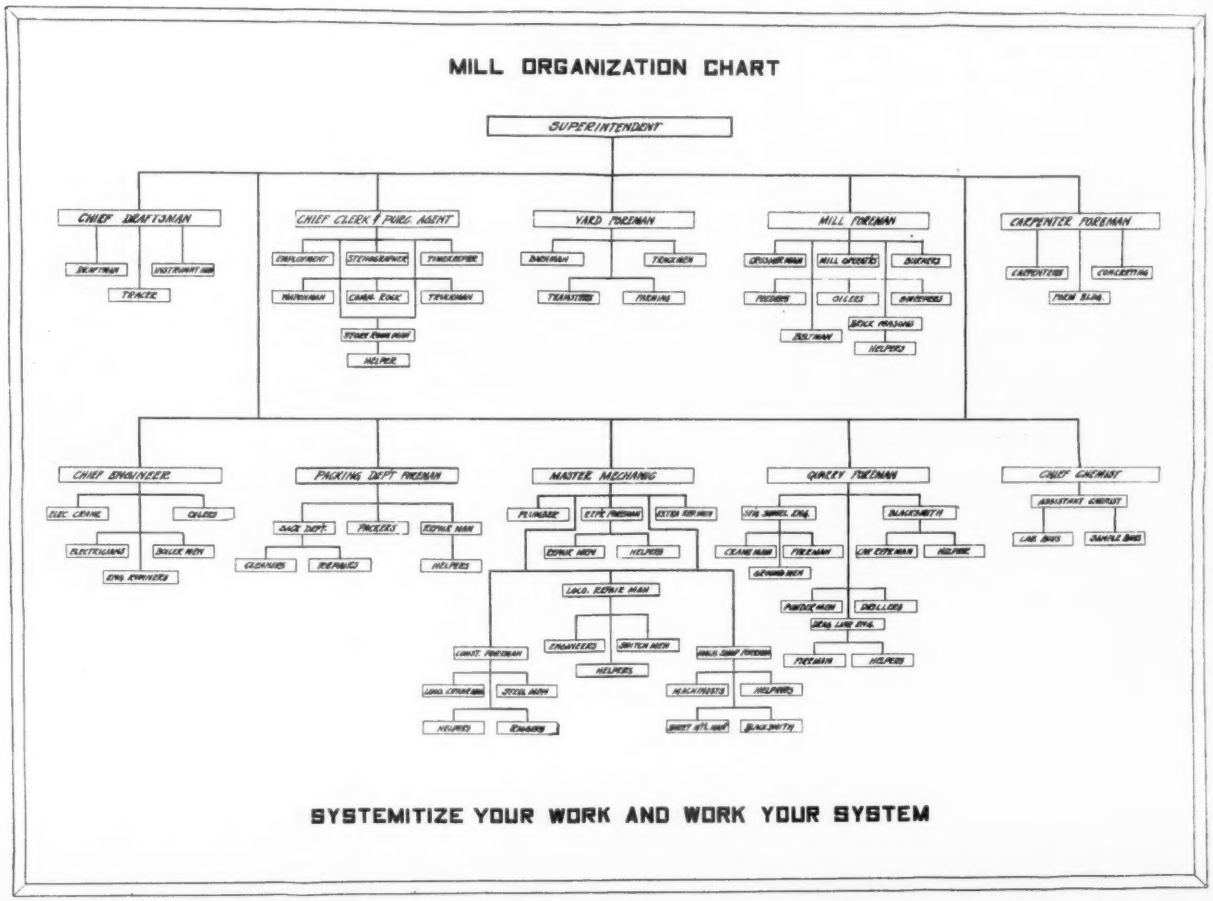
Another result of this delegation of authority is that the chief executive does not have to spend all his time at the desk, but by a brief conference each day with all his department heads he is able to gain sufficient knowledge of the progress of the organization as a whole. The rest of the time he can spend out in the plant, watching operations, studying conditions and devising new ways and means.

Another thing that a well planned organization should not do is to bear grievances. An opportunity should be given to all men to express their opinions. By having this opportunity to express himself, an employee feels that he has some responsibility and is a recognized factor in the industry. In this way each employee feels that he has some direct personal responsibility in the plant and its production.

It is also necessary for a manager or superintendent to know what his men are thinking about. This can only be gained by association and it is a preventive against future trouble. The one great cause for industrial unrest is due to the fact that executives are indifferent as to their employees' opinions. They get too far into the financial side of the industry and disregard the labor end. It has become a potent factor that the human end of industry is an important one and that the human element should be given a great deal of attention.

The whole thing in a nutshell then is to permit more active play of forces so that individual rather than collective responsibility can be increased.

Recognizing that the above was a practical way to gain efficiency, Chas. M. Loveland, Superintendent of the Western States Portland Cement Co., Independence, Kan., developed the mill organization chart which accompanies this article.



Erecting a Crusher

IN ERECTING its new No. 21 gyratory crusher on the concrete foundation shown in one of the accompanying photographs the Monarch Portland Cement Co., Humboldt, Kan., employed a double "A" frame with one beam across both frames. To the beam was attached the chain blocks and tackles that were used to hoist the crusher parts into position.

The bottom shell of the crusher was first set into place by lifting it up on a pier of railroad ties and then moving the "A" frame until a position was obtained where the shell could be hoisted to its next succeeding position on the pier of ties. This process was kept up until the desired position over the foundation was obtained. Then the pier of ties was knocked from under the shell while it was being lowered into place. The same scheme of operation was resorted to in placing the top shell of the crusher on the bottom shell. The crusher as noted is mounted on a concrete foundation and is set directly above the Williams mill, part of which is shown in one of the accompanying photographs. The hopper of the crusher is 21 ft. above ground level and a concrete tramway leads from the quarry to the crusher hopper. H. F. G. Wulf is president and general manager of this company.

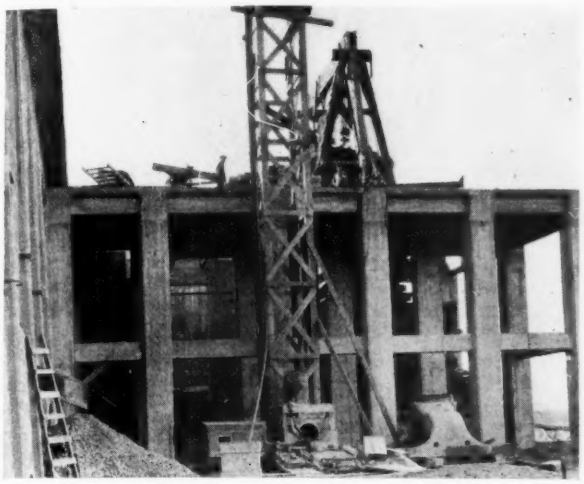


Fig. 1—Crusher foundation

Fig. 2—Bottom shell of crusher and Williams' mill

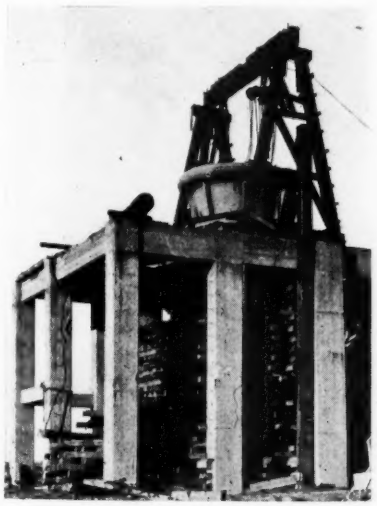
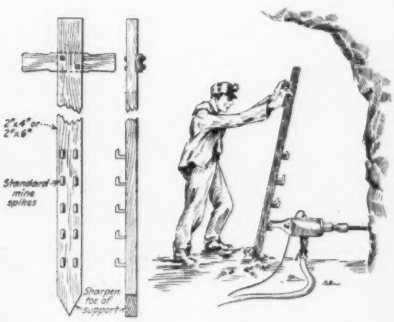


Fig. 3—Dropping top shell into place

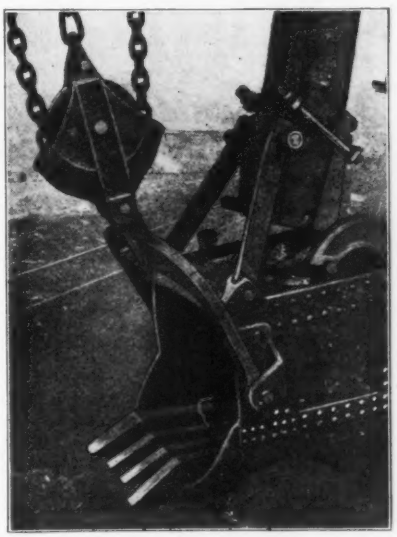
Support for Hammer Drills

THE DEVICE shown in the accompanying illustration may sometimes be used to advantage when drilling with hammer drills. The drawing is self-explanatory and shows only one dimension, that of the support itself, for obvious reasons.—Roy H. Poston, in Engineering and Mining Journal.



Steam Shovel Dipper-Boom Repairs

QUICK REPAIRS can be made to a steam shovel dipper boom by means of a yoke. As an example, the shovel crew on a 100-ton shovel allowed the four large bolts securing the dipper castings to the lower end of the dipper boom to work loose. The shovel was operating under exceptionally heavy duty, and, as a consequence, the two bottom straps on the dipper boom sheared off, the direct result of the loosening of the bolts mentioned. After the 1x6-in. straps had been sheared, the rear bolts could no longer hold against a hard pull. A yoke was made consisting of top and bottom 2x5-in. straps and 2-in. bolts on the sides. The straps were given a twist of about 20 degrees near the end, thus securing a flat bearing for bolt washers. The upper plate or strap, as shown in the illustration, rests on the upper straps and the bottom plate supports the dipper hinge.



The repair yoke has been in service for six months without repairs.—H. H. Hunner, in "Engineering and Mining Journal."

Perfect Dry-Mix Control

New Crushing Plant of the Giant Portland Cement Company at Egypt, Pennsylvania, Has Many Unique Features

WHEN A CONVERT of the wet-process of Portland cement manufacture has to unavoidably face the problem of designing a crushing plant, bins and raw-material feeder system for a dry-process plant—and has the money available to do things right—he can be counted on to produce something worth while. If he is a cement-mill builder of national reputation and conscientiously sets about building a dry-process plant with *perfect control* of the raw materials, he produces something unique. That is just what D. C. Findlay has turned out at the plant of the Giant Portland Cement Co. at Egypt, Pa.

Mrs. and Mr. D. C. Findlay

Mix Control System

The essence of the raw-mix control system consists of a series of concrete bins for the natural cement rock of the Lehigh Valley and a high calcium limestone—the two raw materials in this case—and special feeding out devices. Shale and limestone and silica could be handled in exactly the same manner.

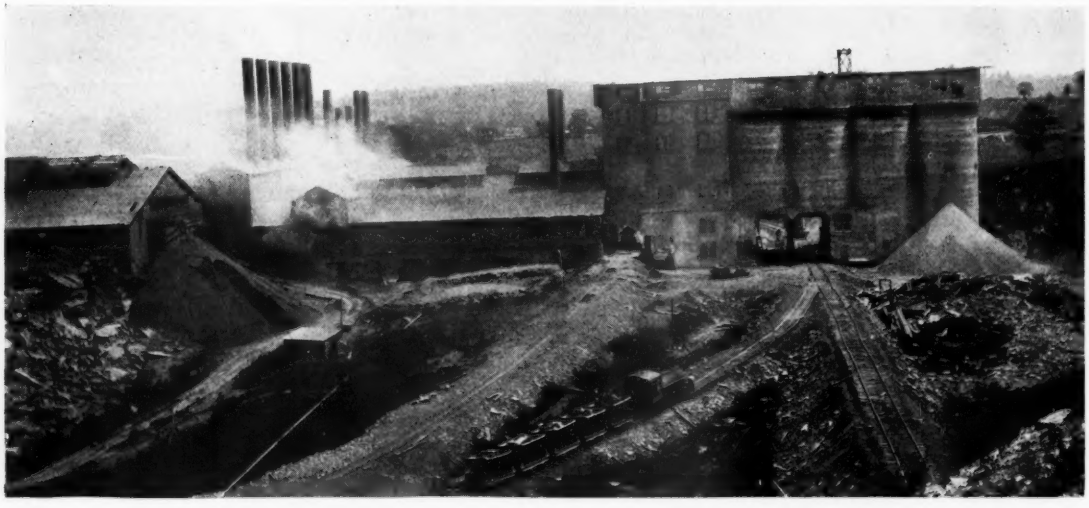
The materials are put through the crushing plant alternately. The crushed materials are distributed to their respective bins and taken away from the bins to the cement plant by a single continuous pivoted-bucket conveyor (Peck carrier), which makes the entire circuit, above, below, and around the ends of the bins.

The buckets receive their load of crushed material from the secondary crushing unit in the "basement" of the crushing plant, and by means of trippers on the top circuit of the conveyor, deposit their load in any one of the eight cylindrical bins or of the four interstice bins.

From the bottoms of these bins the material is fed back to the pivoted-bucket conveyor in measured amounts and in any combination from the various bins through special reciprocating feeders, which deliver all the way from 5 tons to 100 tons per hour each, according to their setting.

The bucket conveyor dumps its load of correctly proportioned raw materials into a chute leading to the dryer-feed bins, just ahead of the chute that fills the buckets with the stone going to the storage. Thus the bucket conveyor is delivering stone to the bins for about half of its circuit and removing and delivering the proper cement mix on the other half of its circuit, simultaneously, if desired.

The contents of the bins are analyzed by the chemist and the automatic feeders from them to the conveyor are set to deliver any amount desired. An automatic sampling device is provided on the top run of the conveyor, which collects one bucket of stone for every complete circuit of the carrier. This sample is divided and subdivided in passing down through the structure and thus automatically gives the chemist an average sample of the whole bin, the surplus going back to the bins.



General view of the cement plant and new crushing plant and bins

Crushing Plant

The new crushing plant and storage bins adjoin the old crushing plant and driers, as one of the plans shows. The new part of the plant begins with the two concrete bins over the two old primary gyratory crushers. These bins receive the properly proportioned raw ma-

General view of the cement rock quarry adjoining the crushing plant

terials and feed them to the dryers. They have a capacity of 200 tons each.

In constructing these drier-feed bins great forethought and care was necessary to prevent interfering with the continued operation of the old crushing plant.

The new crushing plant has a 48x60-in. Traylor jaw crusher as a primary breaker and two 42x48-in. high-speed Jeffrey hammer-mill pulverizers as secondary breakers. The level of the dumping tracks at the crusher is approximately the same as the working level in the adjoining quarry. The primary jaw crusher is therefore set 17 ft. below this level in order to obtain a gravity feed.

Instead, however, of dumping the quarry cars directly into the crusher, they are dumped on a 5x12-ft. Sheridan grizzly feeder, which is set so that it has a slight inclination upward toward the crusher. Cars of 5 tons capacity each are dumped from either of the two railway tracks directly on to this grizzly feeder, which has a reciprocating motion toward the crusher opening.

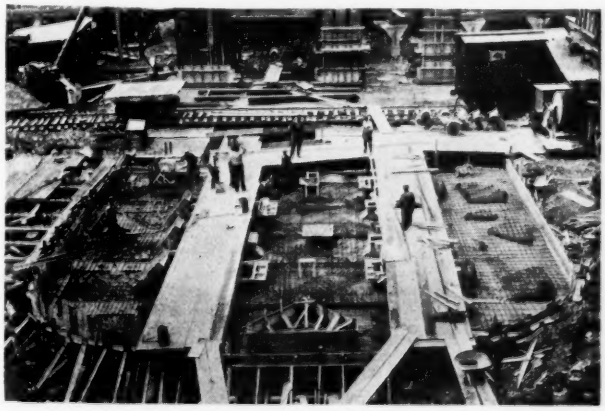
The grizzly feeder is driven by a variable speed motor permitting a control of the crusher feed. The grizzly also screens out everything under 3-in. size and delivers this material direct to the elevator boot, thus by-passing the crusher.

This scheme of feeding the initial crusher has proved very successful. The grizzly bars are 2x10-in. and stand up under the severe service. There is no bridging of large rocks and no choking of the crusher such as happens when train loads are dumped directly into the crusher. The uniform feed to the crusher prevents flooding the elevator buckets and boot and also keeps down the peak power load on both crusher and elevator.

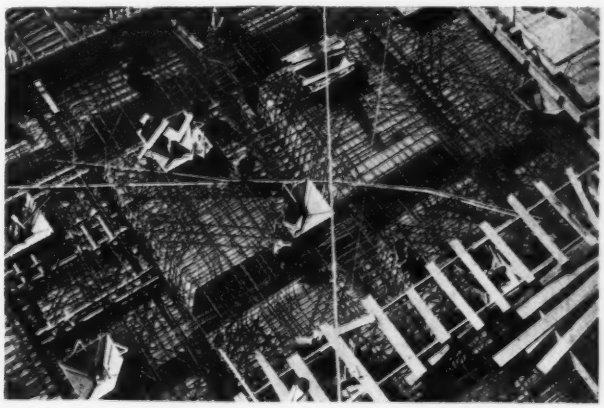
The track location is such that the quarry cars may dump directly into the crusher if the feeder is out of commission or if any other necessity requires it.

The use of a jaw crusher is unusual in the Lehigh district because this type of crusher has not been considered satisfactory for breaking up the slatey natured rock with its tendency to sliver in a jaw crusher. This difficulty was overcome by a special slab breaker attached to the stationary part of the jaw. This is a casting, curved inwards about 5 in., so that any long sliver of rock tending to slide through the bottom of the crusher will be deflected and be caught again by the moving jaw.

General view of new crushing plant and bins



Construction view showing method of pouring floor



Floor system of bins showing heavy reinforcement

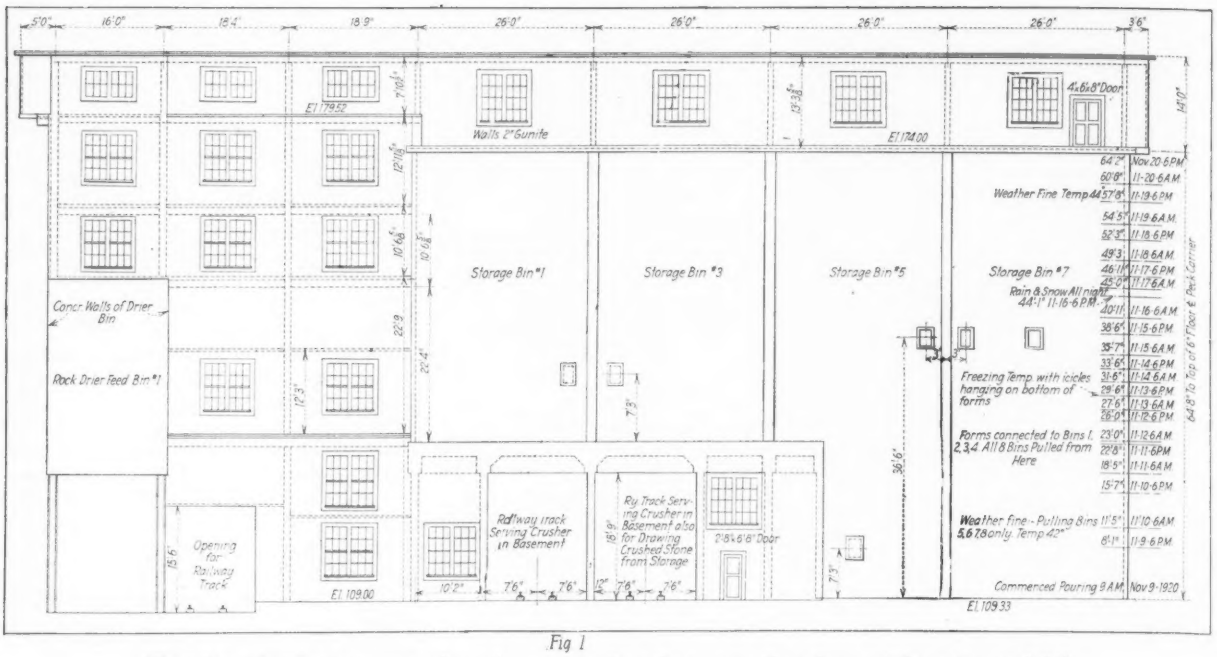

Storage Bin #1
Storage Bin #3
Storage Bin #5
Storage Bin #7
Conc. Walls of Drier Bin
Rock Drier Feed Bin #1
Opening for Railway Track
Railway track Serving Crusher in Basement
Ry Track Serving Crusher in Basement also for Drawing Crushed Stone from Storage
Walls 2" Gunite
Weather Fine Temp. 44°
Rain & Snow All night 44°
Freezing Temp. with icicles hanging on bottom of forms
Forms connected to Bins 1, 2, 3, 4. All 8 Bins Pulled from Here
Weather fine - Pulling Bins 5, 6, 7, 8 only. Temp 42°
Commenced Pouring 9 A.M. Nov 9-1920
Nov. 20 6 P.M.
Nov. 9-1920

Fig. 1

Elevation, showing progress of continuous pouring of concrete (in column at the extreme right)

The use of the large jaw crusher with a 4x5-ft. opening makes possible the quarrying of rock with 100-ton steam shovels and the resulting operating economies.

Secondary Crushing

The screenings of the feeder grizzly and the crusher output are chuted to a 48-in. continuous bucket elevator, 60-ft. centers, which delivers to the feeding spout of the pair of 42x48-in. hammer mills, previously mentioned. These mills are mounted on the ground level floor. Each is direct connected to a 200-h.p. motor. Only one is in use at a time. It takes the output of the primary breaker and reduces it to 2-in. size and under.

The hammer mills discharge by gravity through a steel chute directly to the pivoted bucket conveyor, which goes over and

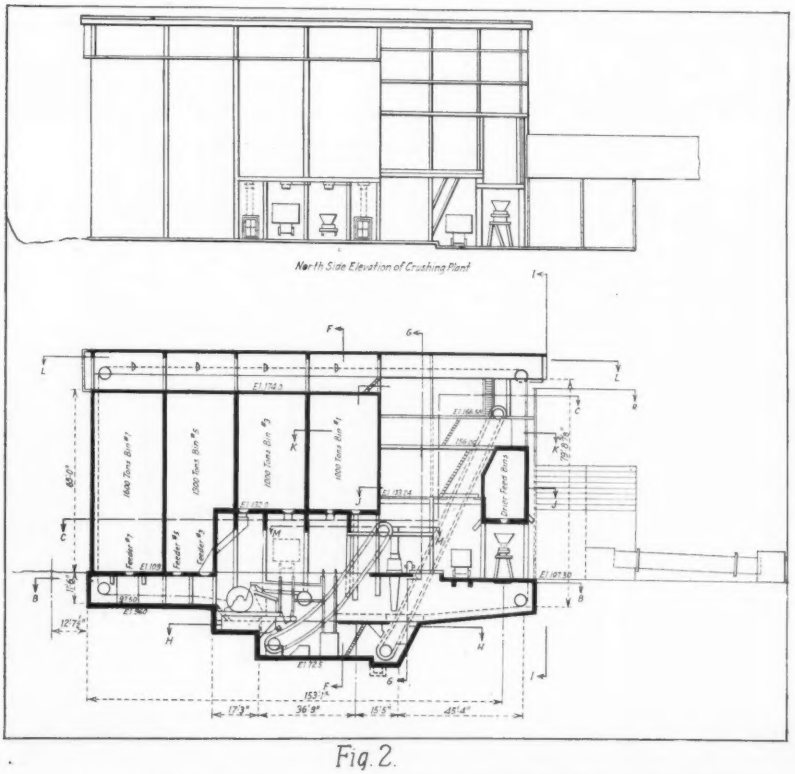


Fig. 2.

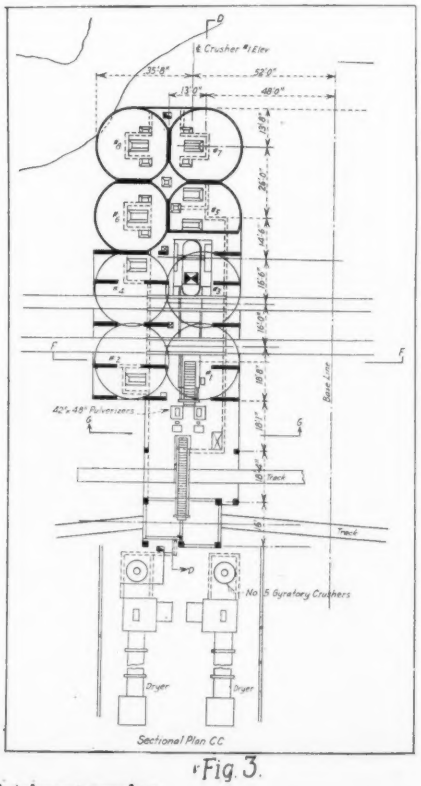


Fig. 3.

Elevation, cross-section and longitudinal section at elevation of primary crusher

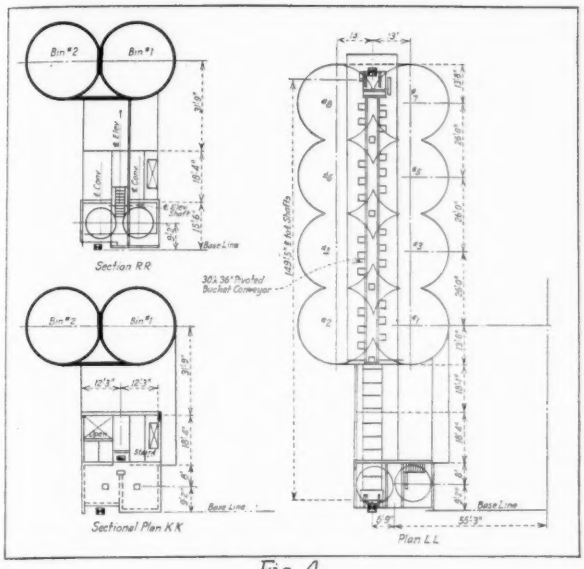


Fig. 4

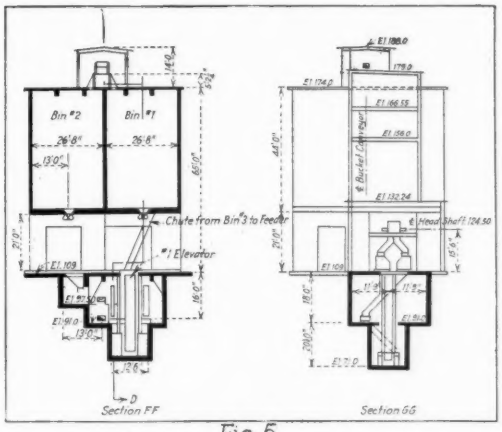


Fig. 5

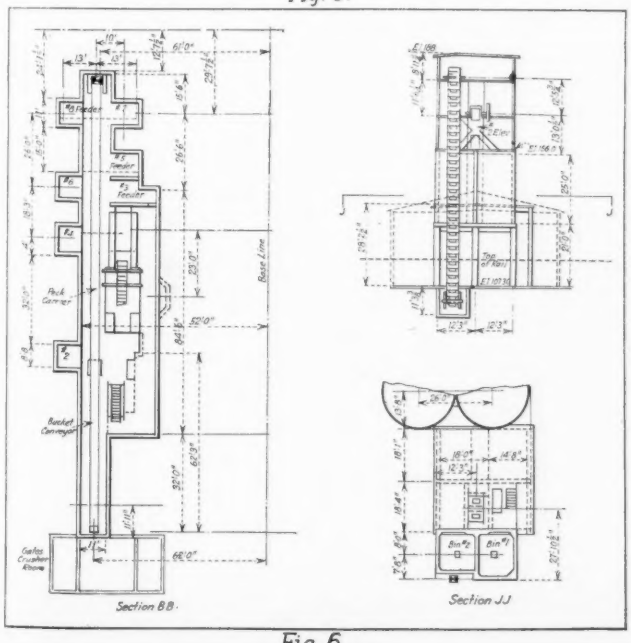
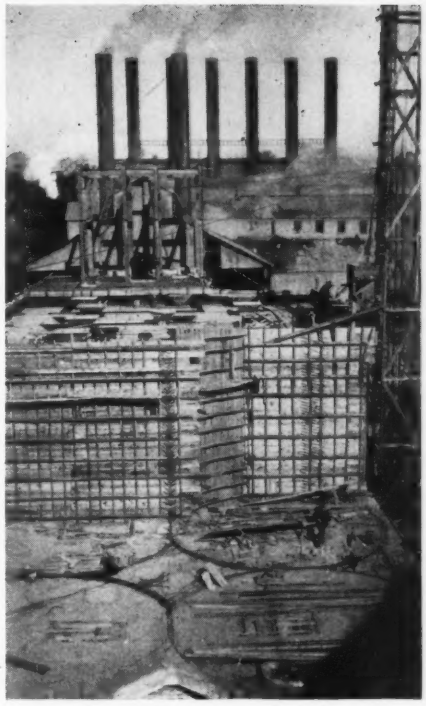
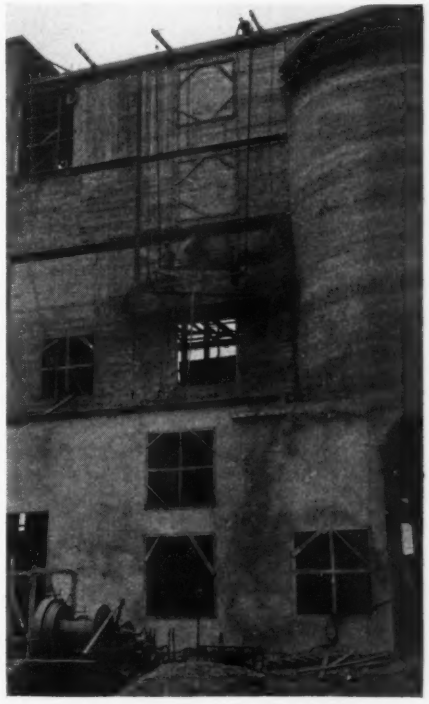


Fig. 6

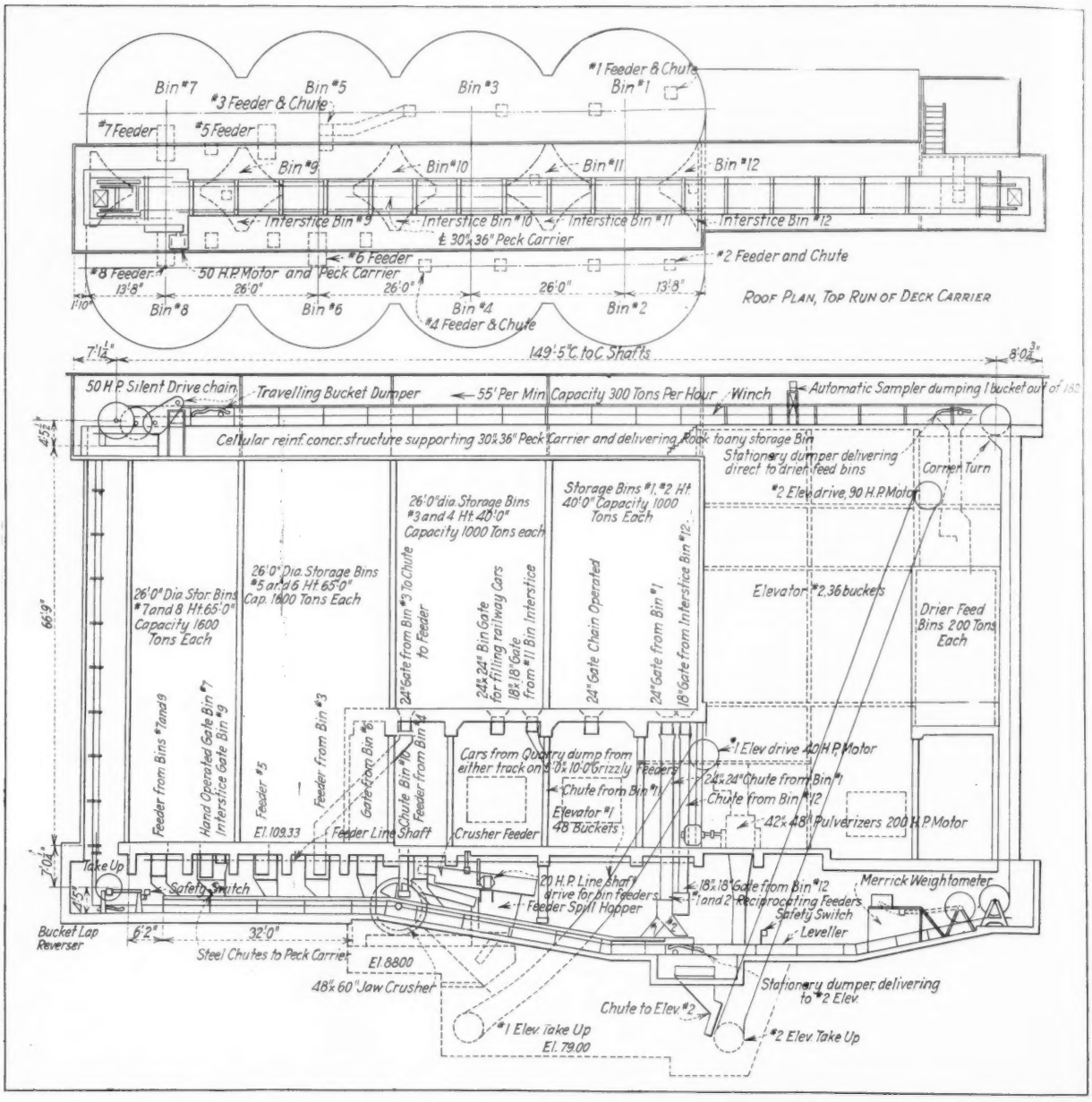


Construction view showing bins and mill

NOTE—Figs. 4, 5 and 6. Various longitudinal and cross-sections showing details



Applying the "gunnite" to walls


Bin #7
Bin #5
Bin #3
Bin #1
#1 Feeder & Chute
#3 Feeder & Chute
#7 Feeder
#5 Feeder
Bin #9
Bin #10
Bin #11
Bin #12
Interstice Bin #9
Interstice Bin #10
Interstice Bin #11
Interstice Bin #12
± 30"x36" Peck Carrier
#6 Feeder
#2 Feeder and Chute
#8 Feeder
50 H.P. Motor and Peck Carrier
13'8"
26'0"
26'0"
26'0"
13'8"
F10"
Bin #8
Bin #6
Bin #4
Bin #2
#4 Feeder & Chute
ROOF PLAN, TOP RUN OF DECK CARRIER
7'1 1/2"
149'5" C. to C. Shafts
8'0 3/4"
50 H.P. Silent Drive chain
Travelling Bucket Dumper
55' Per Min. Capacity 300 Tons Per Hour
Winch
Automatic Sampler dumping 1 bucket out of 182
4'5"
Cellular reinf. concr. structure supporting 30"x36" Peck Carrier and delivering Rock to any storage Bin
Stationary dumper delivering direct to drier feed bins
Corner Turn
#2 Elev. drive, 90 H.P. Motor
26'0" dia. Storage Bins #3 and 4 Ht 40'0" Capacity 1000 Tons each
Storage Bins #1, #2 Ht. 40'0" Capacity 1000 Tons Each
26'0" Dia Stor. Bins #7 and 8 Ht 65'0" Capacity 1600 Tons Each
26'0" Dia. Storage Bins #5 and 6 Ht 65'0" Cap. 1600 Tons Each
24"Gate from Bin #3 To Chute to Feeder
24"x24" Bin Gate for filling railway Cars
18"x18" Gate from #1 Bin Interstice
24" Gate Chain Operated
24" Gate from Bin #1
18" Gate from Interstice Bin #12
Elevator #2, 36 buckets
Drier Feed Bins 200 Tons Each
66'9"
Feeder from Bins #7 and 9
Hand Operated Gate Bin #7
Interstice Gate Bin #9
Feeder #5
El. 109.33
Feeder from Bin #3
Gate from Bin #6
Chute Bin #6
Feeder from Bin #4
Feeder Line Shaft
Cars from Quarry dump from either track on 9'0"x10'0" Grizzly Feeders
Chute from Bin #1
Elevator #1 48 Buckets
Crusher Feeder
#1 Elev. drive 40 H.P. Motor
24"x24" Chute from Bin #1
Chute from Bin #12
42"x48" Pulverizers 200 H.P. Motor
7'0"
Take Up
5'5"
Safety Switch
20 H.P. Line Shaft drive for Bin feeders
Feeder Spill Hopper
18"x18" Gate from Bin #12
#1 and 2 Reciprocating Feeders
Safety Switch
Leveller
Merrick Weightometer
Bucket Lap Reverser
6'2"
32'0"
Steel Chutes to Peck Carrier
El. 88.00
48"x60" Jaw Crusher
Stationary dumper delivering to #2 Elev.
Chute to Elev. #2
#1 Elev. Take Up El. 79.00
#2 Elev. Take Up

General plan and section showing layout of primary machinery details

under the bins, as already described. This conveyor has 182 malleable iron buckets, each 30x36 in., and has a rated capacity of 300 tons per hour. This conveyor deposits the crushed stone in any of the storage bins. The total bin storage for crushed material is 10,000 tons.

The top run of the conveyor is supported on a rectangular bin-like structure through which the stone is discharged by three openings into each bin below. This distributes the material evenly over the 26 ft. of bin diameter and allows the bins to be filled practically to the tops.

Raw-Mix Feeders

Before being elevated to the tops of the storage bins the conveyor buckets pass over a Merrick weightometer, which keeps an automatic record of the daily crusher run. The same device was used to calibrate the automatic feeders under the bins.

These feeders are 3x8 ft. and are set in cells under the bins. They are chain driven from line shafting and have a reciprocating motion. The amount of this motion can be changed by an adjustable cam-like device, shown in one of the views. Also of course the gate opening to the feeder can be changed, and the speed of the drive can be changed by the variable speed motor.

This arrangement gives great flexibility to the raw-material feed system and therefore permits accurate control of the mix. There are eight such feeders, one for each cylindrical bin, and they may be operated one at a time or all together.

In calibrating the feeder settings the stone discharged to the pivoted bucket conveyor was retained in the buckets and passed through the weightometer, then up and back into the bins. Thus an entire binful could be measured if desired.

Drier-Bin Feed

When the feeders under the bins are once calibrated and a curve or table of settings prepared for each, and the analyses of the contents of the bins are known, the entire control of the raw material mix is of course

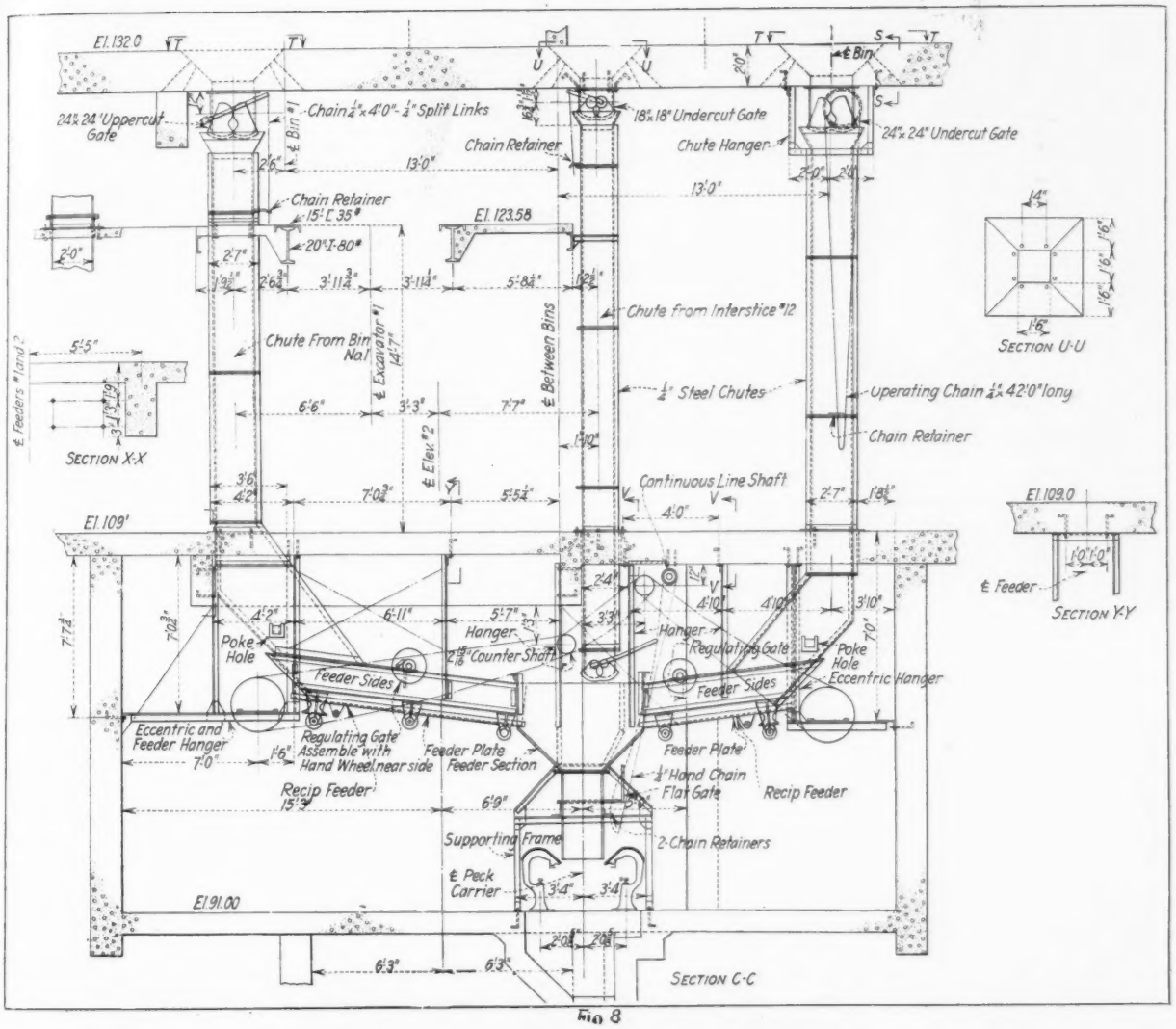
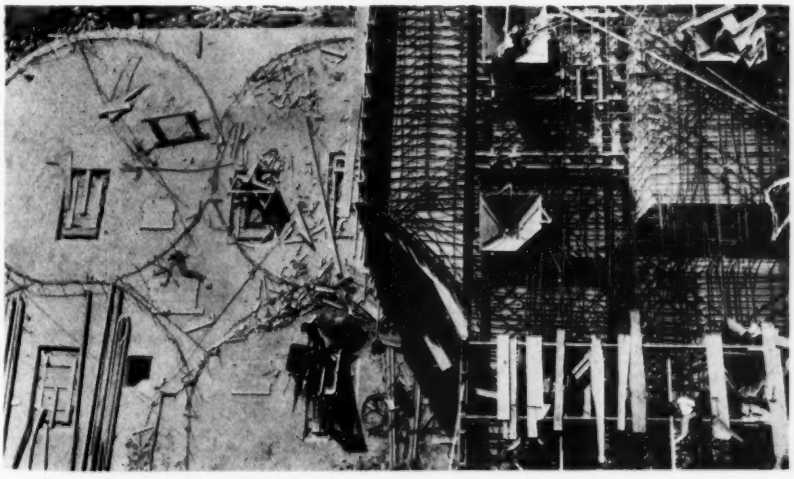


Fig. 8

Detail of chutes, gates, feeders and Peck carrier under bins



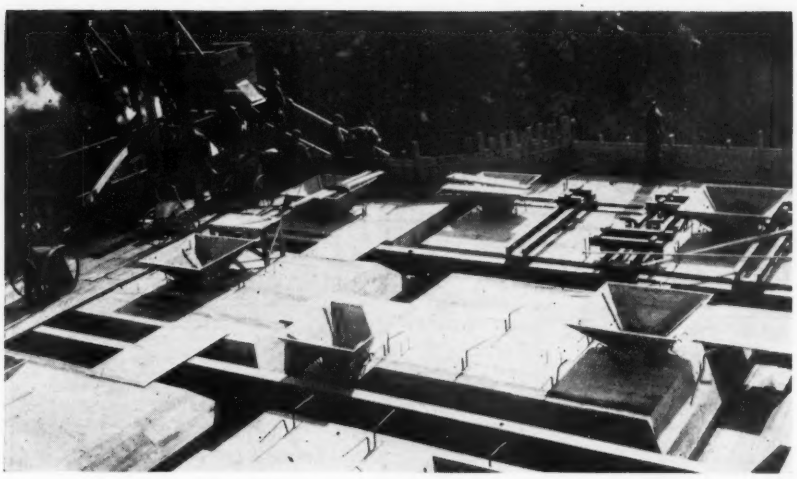
Construction view showing floors of lower tier of bins completed

as much in the hands of the chemist as in the case of a wet process plant with slurry tanks. The chemist merely orders the settings on the bin feeders to be made.

The raw materials are dumped from the conveyor on the lower run to a chute leading to a 36-in. bucket elevator, 96-ft. centers, which takes the mix to the two bins feeding the driers.

This elevator is so placed that it could, in an emergency, take the discharge of the hammer mills and deliver it to the drier bins—by-passing the storage bins. To accomplish this one of the buckets of the Peck carrier is tilted so that the hammer-mill discharge simply passes through it into the boot of the 36-in. bucket elevator. This largely eliminates the possibility of a total shut-down in case the conveyor system is not working.

Should both the bucket conveyor and the hammer mills be out of commission stone can still be fed to the driers from gates in



Floor system of reinforced-concrete bins showing forms for bottom gates

bins Nos. 1 and 2, which can be made to discharge by gravity to the boot of the 36-in. elevator to the drier bins.

The pivoted-bucket conveyor system is such that bins Nos. 1 and 2—or any other bins for that matter—may be filled and used for storage of a cement mix, as well as for either one or the other raw material.

The drier bins have gate openings on both sides as well as in the bottom, so that the mix can be drawn off into standard-gauge railway cars and hauled away, or be fed direct to the two rotary driers through automatic feeders.

Special Features

The crushing plant and the bins over it are built on the bed of an old quarry and all the excavation was in solid rock.

The crushing plant is also designed to serve a second cement mill operated by this company, about a mile distant. This partly accounts for building the four storage bins over railway tracks. These bins discharge by gravity directly into standard-gauge railway equipment for transfer to the other plant. Such cars are loaded at night after the quarry operation is shut down.

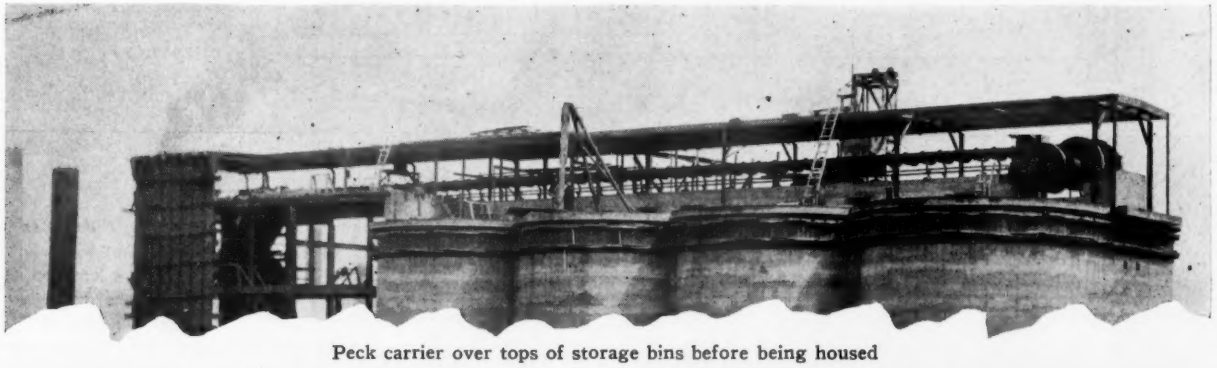
The construction of these large reinforced concrete bins on an elevated substructure, with gate openings in the bottoms of the bins, necessitated some very unusual concrete construction features. The floor slabs are 26 in. thick and heavily reinforced.

The stone is fed out of these elevated bins to the bucket carrier in the tunnel below through 24x24-in. steel chutes, which have chain-operated gates at the tops of the chutes to cut off the flow of rock and permit the chutes and feeders to be emptied when desired, as in freezing weather.

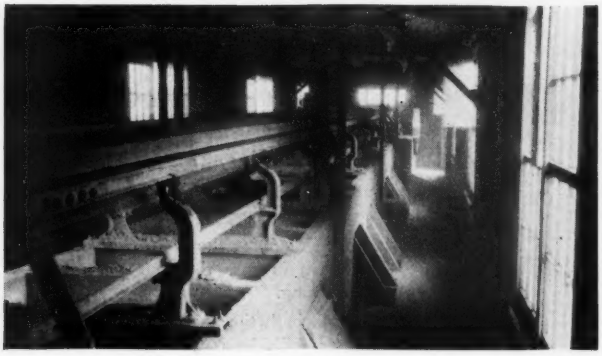
The crusher pit is provided with an overhead traveling hoist, supported by the bin structure, capable of handling any crusher part. The flooring over the crusher pit is made of sections of steel "subway" grating, easily removed to give access to the crusher and providing light and ventilation in the crusher pit.

The plant has a total capacity of 300 tons per hour and requires but one operator and three helpers. The total power required is 725 h.p., if both hammer mills operate simultaneously, or 525 h.p. as normally required. The pivoted-bucket elevator is driven by a 50-h.p. motor through a silent chain drive. The jaw crusher is belt-driven by a 200-h.p. motor and the elevators by 40-h.p. motors and silent chain drives. The reciprocating feeders are driven by a 20-h.p. silent chain drive.

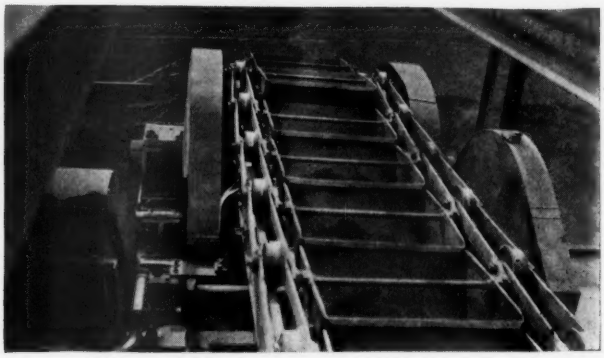
The entire plant is reinforced concrete or steel. The floors, walls, roof, and elevator casings are 2-in. "gunnite" concrete



Peck carrier over tops of storage bins before being housed

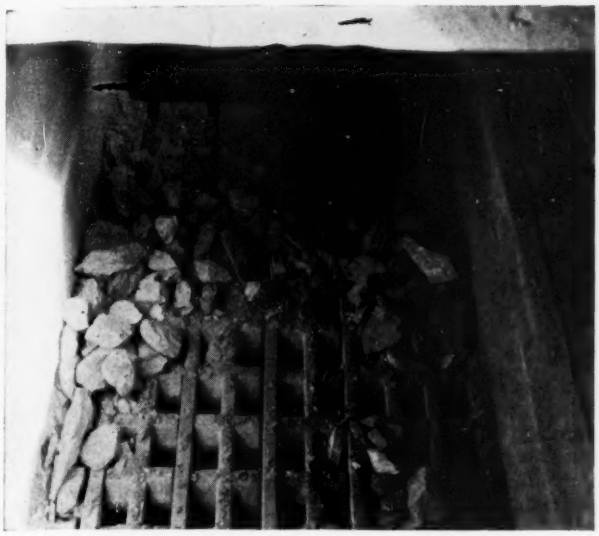


Peck carrier (in motion) showing method of feeding bins below



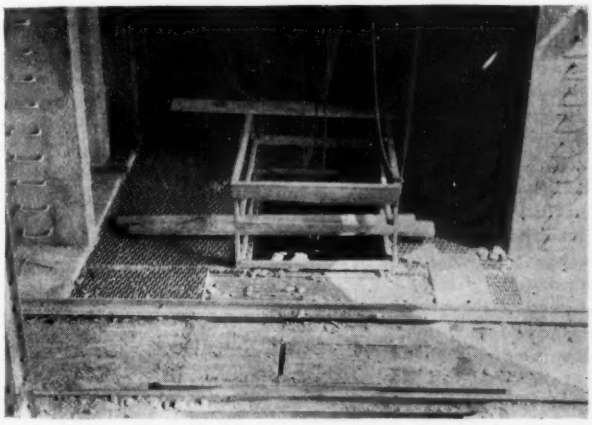
Close-up of Peck carrier and silent chain drive

Various Details of a Remarkable Raw-Material Control System



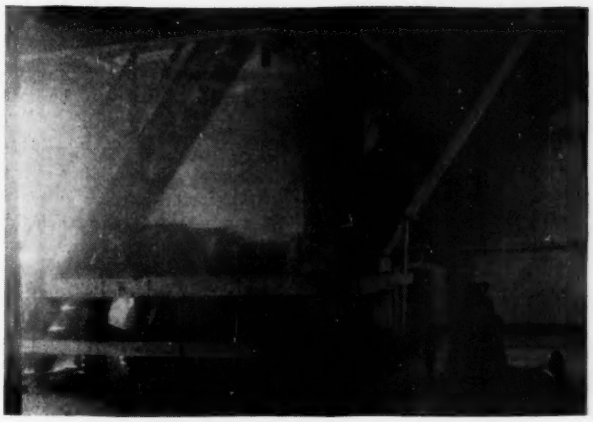
Sheridan grizzly feeder for initial jaw crusher

Bin gates at top of chutes on elevated bins



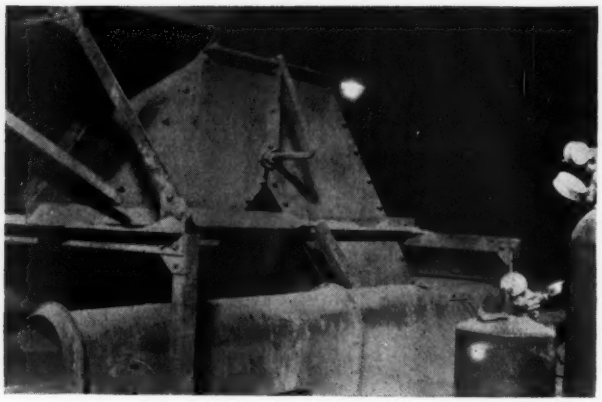
Looking down on jaw crusher pit

Mechanism of reciprocating feeders on raw material bins

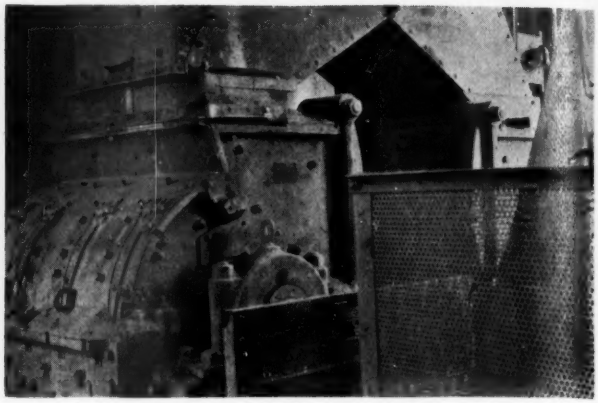


Top of bucket elevator feeding drier bins

Chain drive of a reciprocating feeder from bins



Feeding Peck conveyor with stone from hammer mills



Jeffrey hammer mill as a secondary crusher

on expanded metal. The bins were poured continuously, using sliding wooden forms and 73 special jacks to raise them. The bins are 65 ft. high and were poured from bottom to roof in 11 working days, some of the time in freezing weather.

Personnel

The president of the Giant Portland Cement Co. is Charles F. Conn, of Philadelphia; O. D. Havard is general superintendent and D. C. Findlay is the structural engineer who designed and supervised the construction of the new crushing plant, from the actual survey work to the drafting of the detail plans.

Mr. Findlay is the engineer whose work at the Oregon Portland Cement Co. plant, Oswego, Ore., the Superior Portland Cement Co. plant at Concrete, Wash., the Oklahoma Portland Cement Co. plant at Ada, Okla., and the Nebraska Portland Cement Co. plant at Superior, Neb., and other plants, is well known to the industry.

He is an electrical engineering graduate of McGill University, Montreal, Que., and first got into the cement plant game in Vancouver, B. C. He has since had a hand in the design of nearly every wet-process plant in the western half of the continent.

The crushing equipment of the new Reliance plant of the Giant company at Egypt was furnished by the Traylor Engineering & Manufacturing Co., Allentown, Pa., and the Jeffrey Manufacturing Co., Columbus, O. The conveyors, elevators and chain drives are the Link-Belt Co.'s (Philadelphia).

Wages as Well as Material Prices Must Recede

SOMETHING BESIDES BUILDING MATERIAL price cutting is required to give seasonable impetus to the eastern building construction industry, says the Dow Service Daily Building Reports.

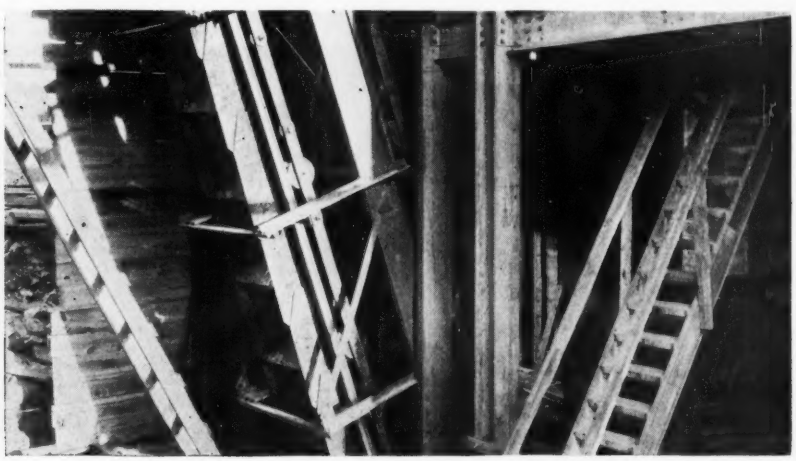
The first half of 1921 has developed building construction, actually requiring delivery of building material barely 40 per cent of a normal year. There has been no gain in building material demand proportionate to the extent of the price cutting that has been resorted to as a bid for business. Even the price cuts that have taken place since the first of the month have checked, rather than stimulated, building material purchasing, with prospects, at this writing, of reactionary effects upon building investors as this price readjustment movement downward continues.

There is one phantom influence that seems to stand out with unmistakable distinctness in analyzing the events of the last six months: a silent protest against existing wage scales. Building investors will not relinquish their insistent demand that building cost be lowered before they authorize construction work. Building costs embrace both building materials and their assembly into a finished structure.

As expressed in the cubic foot cost of a "walk-up" type of non-fireproof construction tenement or apartment today the cost may be generally stated to be 40 cents, net, as against 45 cents in 1919 and 28 cents in 1912. For a six-story elevator apartment the cost is roughly 50 cents, net, per cubic foot today as against 55 cents in 1919 and 32 cents in 1912. For a ten-story high-class elevator apartment the price today will approximate 80 cents, net, as against 82 cents in 1919 and 35 cents in 1912.

Whether the position is legitimately taken or not, the investing builder looks at the unchanged post-war-time peak, still operative in New York, and notes that building material prices have receded, though grudgingly, in the same length of time. He promptly blames both the building trade employer as well as the building trade employee for keeping the cost of construction so close to the post-war-time peak levels.

In the absence of action on either side, more and more projected building operations are being deferred until wage scales are cut. Unless some action is taken this condition will go from bad to worse. Certainly the turn precipitated by the present building material price cutting policy is not making the situation better. Building material price cutting cannot successfully bear the burden of the entire overloaded construction cost item. Even if building material price cutting were to be carried on to a point of ruination.



Bucket elevator for raw material going to the drier

Practical Chemistry for Lime and Cement Manufacturers

Lime Mortar—Chemical Uses of Lime and Limestone—Calcium Sulphate and Plaster

By Richard K. Meade, M. S.
Consulting Chemical and Industrial Engineer, Baltimore, Md.

LIME OWES ITS USE in building to the fact that when it is mixed with water it combines with some of this to form calcium hydrate or slaked lime. When this latter is mixed with sand and used as a mortar the lime absorbs carbon dioxide from the air to form calcium carbonate according to the reaction

$$Ca(OH)_2+CO_2=CaCO_3+H_2O$$

The lime does not begin to harden until the excess water used in making the mortar has been evaporated.

The complete conversion of the lime into carbonate requires a very long time because the carbonate which is formed on the surface protects the interior. Gradually, however, most of the mass is converted to the carbonate and it has been found that the strength of the mortar increases as the change from hydrate to carbonate becomes more complete.

It will be seen that in the manufacture and use of lime we have a complete cycle of events. Starting with limestone or calcium carbonate, we decompose this into carbon dioxide and lime and this lime in turn when made up into mortar reabsorbs carbon dioxide, which is always present in the air, and reverts back to calcium carbonate or limestone. Magnesia absorbs carbon dioxide just as does lime and hence it, too, acts as a binder.

The sand serves two purposes. In the first place, it renders the mass more porous, and hence allows the air and consequently the carbon dioxide to pass to the interior of the mass and convert all the lime to carbonate and not just that on the surface. In the second place, since the sand itself is not altered it prevents the formation of large shrinkage cracks which otherwise would form from the fact that just as lime swells in slaking, it contracts when the carbonate is formed.

If lime is left in the air it will absorb water and carbon dioxide from the air. The lumps fall to pieces and the lime is said to "air slake." Such lime is ordinarily considered worthless, as the absorption of carbon dioxide simply converts it back to limestone. How badly spoiled such lime is will depend entirely on how much carbon dioxide has been absorbed. When the lumps begin to crumble the fine product has simply taken up water and hence has merely been converted to calcium hydrate. It is nothing more than a crude and probably imperfectly slaked hydrated lime. After a time, however, it absorbs carbon dioxide and eventually will be completely changed to the carbonate, when it is worthless. Crushed lime will keep much longer than lump lime.

Chemical Uses of Lime and Limestone

Lime is the cheapest of the alkalies and with sulphuric acid is the base of the chemical industry. Just as sulphuric acid is the starting point for nearly all of the other acids, so lime is the source of all important industrial alkalies and of many other chemicals. Thus if we wish to make soda lye, or sodium hydrate, we boil carbonate of soda with calcium hydrate, when a double substitution occurs and we form calcium carbonate and sodium hydrate, thus

$$Na_2CO_3+Ca(OH)_2=2NaOH+CaCO_3$$

Calcium Sulphate and Plaster

Calcium sulphate is quite common and occurs abundantly in nature as the minerals *gypsum* and *anhydrite*. *Alabaster* is a pure white granular form of gypsum. Gypsum is a crystalline form of calcium sulphate with the symbol, $CaSO_4.2H_2O$, and has, as will be seen from this, two molecules of water. Anhydrite has no water and is distinguished from gypsum by this peculiarity. Both gypsum and anhydrite are usually contaminated by the presence of more or less silica, iron oxide, alumina and carbonates of lime and magnesia, organic matter and sulphides. Gypsum is found in many localities in this country and in Nova Scotia and New Brunswick. Calcium sulphate and also the minerals gypsum and anhydrite are slightly soluble in water.

When gypsum is heated to a temperature of 270 deg. F. it loses three-fourths of its water of crystallization and another sulphate is formed having the formula $(CaSO_4)_2H_2O$ and commonly known as plaster of Paris or calcined plaster. When plaster of Paris is mixed with water it again takes up the water lost on heating, forming $CaSO_4.2H_2O$ again, and in doing so becomes a solid mass.

If gypsum is heated to a temperature 650 deg. F., it loses all its water of crystallization and becomes $CaSO_4$. This is known as dead burned plaster or Keene's cement. This material will also take up water to form again the crystalline compound $CaSO_4.2H_2O$, but the reaction is much slower than with plaster of Paris, consequently Keene's cement sets or hardens much more slowly than plaster of Paris. It is much harder and stronger, however, and may be polished like marble.

If gypsum is added to cement, it will retard the setting of the latter. If cement clinker is ground alone just as it comes from the kiln, it will set so quickly that concrete would harden before it could possibly be placed; it is, therefore, the universal practice to add a small percentage of calcium sulphate in some form or other, usually gypsum, to the clinker before the latter is ground. The grinding of the two together serves to mix intimately the gypsum and cement.

The action of calcium sulphate on cement is peculiar. A small amount will retard the set, but if added in too large a quantity it will quicken the set. Calcium sulphate also has some action on the soundness of cement as addition of this compound to unsound cement will often render it sound.

The standard specifications limit the amount of gypsum which can be added to cement to 3 per cent. They also limit the sulphur trioxide, SO_3, to 1.75 per cent. As most of the sulphur trioxide comes from the gypsum, the percentage of sulphur trioxide found in cement by analysis is an indication of the amount of gypsum in the cement. As gypsum contains 46 per cent sulphur trioxide when pure, 3.8 lbs. of gypsum would contain 1.75 lbs. of sulphur trioxide. Clinker contains some sulphur trioxide, however, so that generally speaking 3 per cent will be about the limit of pure gypsum, or its equivalent of the impure mineral, which can be added without bringing the sulphur trioxide in the cement above the limit.

No satisfactory chemical reason for the action of gypsum on cement has been given. The nearest approach to this is the probability that the calcium hydrate does not crystallize quite so rapidly from a solution of calcium sulphate. This is, of course, formed when water is added to the cement containing gypsum, as the latter is soluble in water.

(To be continued)

Wet-Mortar Plants to Promote the Lime Industry*

"A Chapter of Successful Experience"— Covering the History of the Mixed Mortar Business in the United States

By W. C. Hay
Vice-President and General Manager,
Blue Diamond Plaster Co.,
Los Angeles, Calif.

CONCERNING MACHINE-MADE MORTAR, Kidder's authoritative and nationally-known "Architects and Builders Handbook," says:

"In several of the larger cities plants have been equipped for the manufacture of mortar by machinery. Machine-mixed mortar should be much better than the ordinary hand-mixed mortar, for the reason that time can be given for the lime to slake, the lime and sand can be accurately measured and the hair and sand are not mixed with the lime until just before delivery. The mixing may also be more thoroughly and evenly done by machinery than is possible by hand." It should also be added that the lime paste can be properly aged at the plant which is usually not possible at the job.

The foregoing claims of superiority of the machine-made over the hand-made mortar were demonstrated over 20 years ago, and yet in the face of such truths, those wet mortar plants referred to by Mr. Kidder, as well as those which were later erected, proved almost without exception to be unprofitable investments. With the exception of two, all those former plants have been dismantled and sold as junk. The two referred to have continued to operate with only varying degrees of success.

In view of such a showing, is it any wonder that a deep-seated prejudice grew up in the minds of many lime manufacturers, masons' supply dealers, and others? Such prejudice, however, that went so far as to condemn the entire mortar plant idea was as unjust as it was unreasonable.

This paper has been prepared partly with the object of correcting such misunderstanding of this basic business, and accordingly we propose to present the salient facts connected with the evolution of the mortar business in this country; its start, its failures, its growth and its final success, together with a frank and impartial analysis of the causes underlying the downfall of the early plants, as well as the reasons for the success of the later plants.

History of Mixed Mortar Plants

As far back as 1866 a United States patent was issued for a mortar plant design. The design was so impractical, however, as not to merit further mention. Since that time patents of many descriptions have been granted which directly or indirectly referred to mortar plants, mixers, slakers, compositions, etc. Notwithstanding the fact that most of these inventions were impractical, they did prove that a lot of people considered the making of mortar by "the man with the hoe" method wrong.

W. C. Hay

The most active period of invention and construction of central mixing plants was between the years 1890 and 1905. In that time, plants were erected in New York, Philadelphia, Wilmington, Washington, Columbus, Los Angeles, and many other cities throughout the country. While every plant claimed its own separate patent, the fact remains that with very few exceptions all of those plants were designed and constructed along the same lines. The results conclusively proved that the designs were fundamentally wrong. To those broadly experienced in the operation of mortar plants, the following list of errors in those designs are readily apparent:

1. General arrangement of plant too cumbersome, its size and cost being out of all proportion to its ability to turn out finished products.
2. Too much weight supported above ground.
3. Excessive machinery installation of improper type, resulting in high consumption of power.
4. No proper means provided for properly storing or feeding the lime to the slakers, resulting in extra labor expense.
5. No proper means provided for properly storing or feeding the sand to the mixers, resulting in extra labor expense.
6. No proper means provided for handling aged or cured lime putty, resulting in extra labor expense.
7. Poor slaking method.
8. Poor mixing methods.
9. Poor delivery methods.
10. Most important economic feature entirely overlooked, viz., aerating of cured lime putty.

In pointing out these erroneous features, it has often been remarked: "Why, if these were such serious mistakes, were they not sooner discovered and rectified?" In considering this query, these facts must not be lost sight of: That all those plants referred to were erected within a very few years of each other; that every plant had a separate inventor and ownership; that every owner and inventor had no extended mortar business experience; that there was no co-operation between the several inventors or owners to discuss, study and improve the inventions. That such a condition existed is not surprising, as the business was purely local in its nature, being limited to such market that existed within only a few miles of the plant.

In the face of this limited view, and as the continued operation of the plants showed no profit, the owners concluded that the business was not worthy of serious consideration, and therefore closed their eyes to the working out of essential improvements. The closing chapter of

* Paper delivered by W. C. Hay, at the annual convention of the National Lime Association, held June 15 to 17, Commodore Hotel, New York City.

every plant was the same, and accordingly no advancement was recorded in the art of manufacturing and delivering ready-mixed mortar for many years.

How different was the story of the automobile: The first auto and the first mortar plant were built in the same decade. Both were failures, but perseverance by those pioneer auto mechanics in the face of failure and discouragement resulted in the most stupendous success. Contrast this with the mortar plant builders, who laid down on their first failure and said it could not be done; that the idea was unsound and impractical. These premature conclusions stood unquestioned for many years, and not until the year 1913 was their falsity proven. As a fitting introduction to the inventive work that was done after the failure of those early plants, and prior to 1913, permit me to recite some intimate gossip that will serve as a context to the rest of our story.

Personal Experiences in the Mixed Mortar Game

In 1908, while visiting an old schoolmate in Mexico City, I met a prominent engineer. The acquaintance subsequently ripened into a warm friendship, and in our talks we often discussed the many construction innovations that had been introduced in America. Among them was the mortar proposition. The idea of mixing mortar at a central station and delivering it to the building ready to use, struck me as a good one. Upon returning home, I at once set out to collect all of the data I could on the subject.

At this time I was blissfully ignorant of the building material business generally, although not of golf or of social ethics. Also, I possessed quite a stock of perseverance and energy, also a small sum of money yet large for one of my limited experience.

My first point of attack centered on the lime manufacturers and masons' supply dealers. Their advice and information concerning the mixed mortar scheme was so gloomy and discouraging that I soon passed them up. My attention was next centered on three plants which at that time had not been dismantled. This investigation was carefully made and painstaking in the extreme, and when completed it was obvious that the mortar idea was all right, but that the plants were all wrong. With the meager knowledge gained, I studiously set to work to make a plant that it was believed would be altogether right.

The design was radical and the plant, when completed, would not work. Several arduous and discouraging weeks were spent in tearing down, changing, rebuilding, etc. Finally the affair developed to a point where it could turn out a fair grade of brick mortar at a slight saving. Needless to say, this plant fell far short of my ideal. Accordingly, I again set to work on a new design which, it was believed, would be correct in every detail. This plant never did produce a yard of mortar. The seemingly improved machines simply would not function. After weeks spent in tearing out and rebuilding, I dismantled the plant and erected on the same site another one which was also a mechanical failure.

These experiences extended from 1908 to 1911, and notwithstanding the time and energy lost, together with the thousands of dollars thrown into the discard, my belief in the soundness and practicability of the mortar idea never wavered. In fact, these failures only seemed to make me more determined to work out some right plan. At this point the painful conclusion was reached that I knew very little about mortar plants, or anything connected with the business. After pulling up the slack in my belt, I grimly set out to learn something about the subject, and accordingly, every book which could be found that dealt with limes, mortars, plasters, mixers, mortar plants, hair pickers, agitators, sand, etc., was read. Also copies of all patents were secured that in any way related to plants, mixers, plastic compositions, processes, etc.

After two years of study, I again made another attempt and in 1913 designed and erected a plant in Oakland. This was a success from the day it started. Its cost was low, operation simple, and the results profitable. Patents which I then had pending were later granted, and owing to the success of this plant, the San Francisco rights were soon purchased by those who were the chief stockholders in the Oakland plant.

I designed and erected the San Francisco plant in 1914, in which was incorporated some added improvements. That plant was also a success from the day it opened. Both plants were then taken over and operated by the Atlas Mortar Co. It can be said that this company has for years dominated the lime and mortar business of the two California bay cities. It enjoys a very large business in ready-mixed brick mortar, fibered lime plaster, Keene's cement, gauged lime plaster, and lime putty. For some years it purchased its lime requirements direct from the manufacturers, but a few years ago the mortar company bought out the old established Pacific Lime & Plaster Co., and now produces its own lime.

The Blue Diamond Plaster Co.

In 1915, J. W. Jameson, a large and successful oil operator of California, after seeing the San Francisco plant, purchased my Los Angeles rights, and entered into a contract with me to build a plant. His purpose in doing so was to market lime from the Jameson Lime Co.'s kilns, which plant had been closed down for several years, owing to the falling off in the plastering lime business occasioned by the growth of the gypsum plasters. This Los Angeles mortar plant commenced business in the spring of 1916 under the name of the Blue Diamond Plaster Co. At that time, prices of lime, sand, plaster and labor were at the bottom. Also, the builders were using only gypsum plaster. In the face of these apparently unfavorable conditions under which to start a mortar company, the concern did a good business from the beginning. Brick mortar was at once marketed in large volume, a cubic yard being manufactured and hauled a distance of from two or three miles at a price of $2.10 per cubic yard, 15 cents being added to each cubic yard for every additional mile delivered.

Just consider for a moment what economies were necessary in order to be able to make such a price. Needless to say, the company did not get rich. Nevertheless, it must be added that it did not go into red ink either, which is saying a whole lot when those unfavorable conditions are considered. A drive was also made on Keene's cement gauged lime plaster for interior work, and lime plaster gauged at the building with Portland cement for exterior work, also finishing putty. The success of the effort may be judged when it is considered that the majority of the larger buildings erected that year in Los Angeles were plastered with "Blue Diamond" lime mortar products.

The news of the success of the three California plants spread rapidly and it was not long before letters of inquiry were received from almost every section of the United States. As Los Angeles was my home, and as the future for the business looked promising, I purchased an interest in the company from Mr. Jameson. We then incorporated with a paid-up capital of $100,000. Our resources then included a two-unit Hay mortar plant capable of turning out approximately 150 cubic yards of mortar per day, and 100 barrels of finishing putty; a small sand and gravel plant, and a few auto trucks.

Tremendous Growth of Los Angeles Business

While the war lasted, our tonnage was very small, owing to the limited building activity. Throughout this period, however, we were able to operate without a loss. Soon after the signing of the armistice, building became brisk, and the plant tonnage jumped ahead at a surprising rate. Our sand and gravel facilities were then increased, and we also added a few staple lines of building materials. Warehouses were then built; the Jameson Lime Co. was taken over; 15 extra acres in the manufacturing district of Los Angeles were acquired; a hydrating unit was erected; the largest stone crushing plant and quarry in Southern California was

purchased; the exclusive marketing of a gypsum mill was secured; distributing rock bunkers were erected in the city; many additional auto trucks were added, and our stock of general builders' supplies was greatly enlarged. Two other manufacturing units are just now being added.

Today this company does the largest masons' supply business in the West, and the company has resources of $1,500,000. Our activities include manufacturing, wholesaling and retailing, Los Angeles City being the retail center, while wholesaling is done in the outside territory.

Our daily tonnage is approximately 70 carloads in the entire territory. Our retail business in Los Angeles City requires upwards of 40 auto trucks for the delivery of the different products.

This company has enjoyed a very rapid, yet healthy growth, the business being built up from and centering around the mortar plant. It has expanded to such proportions that today we have nine distinct departments, and you lime producers should be interested to know that the most profitable of the nine is the mortar department.

Prices of Mixed Mortar

At the present time our retail prices on the mortar plant products are:

Brick laying mortar	$4.25 per cu. yd.
Fibered lime plaster mortar	6.00 per cu. yd.
Keene's cement gauged lime plaster mortar	9.50 per cu. yd.
Lime putty	.70 per cu. ft.

These prices are f. o. b. plant, and cartage is charged extra. All mortar is sold by the cubic yard and is delivered in regular stock type auto dump trucks. A minimum charge of $1 per cubic yard is made for delivery, which charge covers a distance of approximately three miles from the plant. Additional mileage is charged at the rate of 15 cents per cubic yard per mile.

The lime putty is delivered in second-hand iron barrels which are easily handled at the job. Barrels are charged out at $1 each and credited back when returned in reasonable condition, at 90 cents each.

The above schedule of prices shows that a cubic yard of brick mortar is delivered in the business section of Los Angeles for $5.25, or $5 if the bill is paid on or before the 10th of the following month.

Now for the sake of comparison, recall to your minds what this cubic yard of ready-to-use mortar would cost if made up by the contractor at the building. One cubic yard of sand would be required, approximately 300 pounds of first-class quick lime; second, approximately one-fifth of a labor day of two hodcarriers to slake, mix and temper. With sand at $1.75 per cubic yard at the job, lime at $20 per ton, and a hodcarrier at $6 per day, the cost of a cubic yard of mortar, when made up at the building, would amount to approximately $6, and mark you, this is an extremely low cost. In most cities today, this cost is nearer $7 than $6.

The comparative cost of plaster mortar is even more marked than of brick mortar and when compared with gypsum plaster mortar is extremely marked. A cubic yard of gypsum hard-wall mortar contains approximately one-half ton of plaster, one cubic yard of sand and one-third of a labor day. Plaster at $20 per ton net, delivered at the job, sand at $1.75 per cubic yard, and the hodcarrier at $6 would make a total cost of $13.75 per cubic yard. Our selling price, as above stated, on fibered lime plaster delivered at the job in the business district is $7 per cubic yard.

These selling prices are quoted and the comparison is made in order to clearly bring out the fact that although our mortar department is the most profitable one of all departments, our selling prices are really very low; in fact, it costs more to produce mortar by hand in any city of the United States, although the Hay plant cost on mortar is about the same the country over.

Reasons for Good Profits

The next question that arises is, "How can the plant make such good profits at the prices obtained for the products?"

Generally speaking, for two reasons: First, that the plant can use any grade of kiln-run lime; second, that the process of manufacture is such as to effect a large economic saving.

The first reason needs no explanation. As lime manufacturers, you know too well the extra cost of producing selected lime for the lump trade, which high standard of quality must be maintained to hold your prestige and business.

By having the mortar plant, our lime cost is less. It is not essential nor necessary to pick only the clear rock which will make good looking lumps of lime. Also, the fuel cost is lower, as the stone does not have to remain in the kiln until the last atom of carbon dioxide is driven off, and in addition, the troublesome and expensive barrel or package feature is altogether eliminated. Where the contractor will not have "corey lime" the mortar plant is not so particular. In the plant, the core, ash, or any impurity is automatically thrown out as the slaked fluid flows from the slaking machine to the curing vats.

The second reason advanced for the plant being able to make such good profits is best set forth by describing the method of operation. The fundamental features embodied in our plant, and which are essential for the successful operation of any mortar plant, are the following:

1. Low plant cost.
2. Minimum machinery installation of simple type and rugged construction.
3. Design of such nature as to permit elastic operation that would allow small or large output without changing normal labor requirements.
4. Utilization of aerating principle.

These underlying principles of construction and operation have been closely adhered to in the Hay process, and I here with enlarge on each principle involved:

1. A single-unit plant capable of a maintained daily output of upwards of 100 tons of finished mortars per day can be built at a cost of from $8,000 to $10,000.

A two-unit plant with upwards of 200 tons daily capacity can be erected at a cost of from $15,000 to $18,000.

2. The larger of these two plants contains only five separate machines. The designs are such that the machines are driven with a minimum power, while the wear and tear is negligible. The total power installation in the entire plant is less than 50 h. p. All machines are driven by separate and direct connected electric motors.

3. The plant is operated to its capacity with two men, and if a tonnage of half the capacity of the plant is maintained, one operator is sufficient. The slaking, curing and mixing features are so arranged as to make it possible for the one operator to be kept busy continuously. The mixers are of a continuous type and are of such speed as to permit of the turning out of a finished cubic yard of mortar in two minutes.

4. The aeration of the cured lime putty is, without doubt, the greatest advance made in the art of producing ready-mixed mortar. By violently agitating the cured lime putty, it is given a spreading ability of upwards of 25 per cent of its former stretch; at the same time, this agitation does away with the very excessive labor-handling charge that was formerly required. Also, this agitation reduces the stiff putty to a thick fluid consistency, making it possible to feed the cured lime paste in a steady, measured flow to the mixers.

When it is considered that this two-unit system with a large and elastic capacity can be erected at a cost of approximately $16,000, and can be operated to its capacity with two men and with less than 50 h. p., and can produce the highest grade of mortars and putty with a saving in lime content of approximately one-third (kiln-run, at that) than mortars prepared in other ways, you cannot wonder that these plants have made such a record of success in the cities in which they have been erected.

As to the quality of the products turned out by these plants, too much cannot be said. The products are properly slaked, properly cured, thoroughly mixed, and work cool and smooth under the trowel. As one hydrate manufacturer aptly says, "They spread like warm butter." Hard

and soft lime mortar, both fibered and unfibered, are made with equal ease, and are extensively used and sold for exterior and interior plastering, and are ideally adapted to all kinds of construction, being suitable for application over wood lath, metal lath, and patent laths, on tile, brick or concrete surfaces.

The advantages and disadvantages resulting from the use of lime mortars are familiar to you all. The advantages are many and varied and the disadvantages are practically all eliminated when lime mortar of high quality and low price can be delivered to the building in a ready-to-use condition.

The mortar business is essentially a retail business, acccordingly it is not expected that the lime manufacturers will generally take up with the idea. It is, however, believed that the progressive lime manufacturers will find ways and means of having these Twentieth Century mortar plants erected through either the masons' supply dealers, sand companies, trucking concerns, or others. In so doing, the wide-awake manufacturer will greatly increase his line tonnage, at the same time reducing the troublesome and expensive features incident to marketing selected lime, as well as barrels.

In closing, let me emphasize these two fundamental points:

First. *That the early-type mortar plants were failures simply because they could not produce mortars at less cost than the contractor.*

Second. *That the Hay process plants are successes because they are producing better mortars at a lot less cost than the contractor.*

The future for these plants is very bright. The success of the process has been clearly demonstrated in the face of the most difficult conditions. The mortar market is almost as staple as the bread market. The demand is tremendous and no one is in the field but "the man with the hoe." The builders are not only willing but anxious to give up the making of mortar at the job, and they stand literally hungry to buy these high-grade mortars at a price equal to their (prepared at the job) cost, and mind you, their cost allows the plant a very substantial profit. In fact, a much larger profit than is earned by the lime manufacturers.

End of an Old Lime Plant

THE OLD LIME PLANT and sheds of Harrison and Curtis, West Broadway, Newburgh, N. Y., are being taken down and removed.

The plant consisted of three kilns 7 ft. in diameter by 22 ft. high and formerly produced a dolomite lime for both building work and agriculture.

Construction Industry a Basic One

IN a special report issued June 17, by the Committee on Statistics and Standards of the United States Chamber of Commerce, Washington, D. C., of which A. W. Douglas of St. Louis, is chairman, the total national wealth of the United States is estimated at $288,464,000,000, of which $77,321,000,000 or 26.8 per cent is represented by the Construction Industry. The report presents an analysis of the relationship of construction to the basic industries of the nation, including manufacturing, mining, transportation, agriculture, trade and finance, and concludes that construction as a key industry should be classified separately as one of the nation's basic industries.

Twenty-Five Per Cent of Manufacturing for Construction

The report shows that in 1914 one quarter of the 276,000 manufacturing concerns employing 10,658,000 workers with an annual payroll of $5,368,294,000 and an annual output worth $25,000,000,000, was devoted to construction products.

In 1920, 90 per cent of all iron ore, copper and zinc, and 95 per cent of all lead mined was consumed by construction. Twenty per cent of the bituminous coal and five per cent of the anthracite coal mined was used by manufacturers of construction materials, by the railroads in transporting these products, and by traction lines and public service corporations in service to construction workers. A rough estimate of the value of these minerals is $4,400,000,000 engaging more than 1,000,000 workers at an annual wage of approximately $1,000,000,000.

Twenty-five per cent of the freight transported by the railroads is construction materials.

Eleven Million Persons Depend on Construction

Eleven million persons, either as workers or as members of workers' families are estimated to derive their living from construction, either directly or through manufacturing and mining products used in the construction industry. The support given to agriculture and to trade by the annual expenditures of this great number of persons is estimated at more than $5,000,000,000 for rent, fuel, food, clothing, furnishings, recreation, etc.

Half of New Capital Issues for Construction

New capital issues during 1920 so far as reported, totaled $4,545,000,000, consisting of state, municipal, railroad and industrial securities, of which it is estimated 50 per cent were issued for construction in one form or another. A considerable portion of the new capitalization went to pay off maturing obligations, which were reflected, however, in past construction to a large extent.

Even this estimate does not cover the whole field. It excludes indebtedness of the federal government for construction, for which segregation is difficult, and does not include issues of foreign governments or municipalities in this country, the proceeds of which were to be used for improvement and extension of their public undertakings. This sum also is short a huge amount of expenditure for new construction because a great amount of expenditures for additions to plant, structures, etc., is paid out of earnings and surplus and does not figure in the investment market. With all these figures at hand it appears that 24 per cent of the year's capital accumulations, and probably 50 per cent of the national savings annually go to construction.

Construction—A Basic Industry

Based on this analysis, the report concludes that the construction industry is a unique barometer of the state of business in all industry and as such deserves a separate classification among the basic industries of the nation on a par with agriculture, mining, manufacturing, transportation and communication, commerce and finance.

Nebraska Cement Rates

THE INTERSTATE COMMERCE COMMISSION has reopened for further hearing Docket 11829 for further consideration of cement rates between points in Nebaska These rates were originally authorized advanced 35 per cent by the Interstate Commerce Commission.

Long Haul Rate on Molding Sand

THE INTERSTATE COMMERCE COMMISSION has dismissed No. 11503, Rock Products Traffic League vs. Director-General, as agent, C., B. & Q. R. R. et al., opinion No. 6922, 62 I. C. C. 105-6, holding that the rate on molding sand from Ottawa, Ill., to Chattanooga, Tenn., between August 1, 1918, and May 29, 1920, had not been shown to be unreasonable or otherwise unlawful. The complainant alleged that the rate of $3.70 a ton charged by the carriers, was unreasonable and unduly prejudicial to the extent that it exceeded $3.20, contemporaneously in effect from Ottawa to Pittsburgh, Pa., Buffalo, N. Y., and other points in the same group. Most of the shipments moved through Evansville, Ind., and Nashville, Tenn., a distance of 641 miles. Complainant cited rates of $2.30 from Ottawa to Cleveland, O., 428 miles, and $2 to Wallaceburg, Ont., 523 miles, and insisted that transportation conditions from and to these points were similar to those from Ottawa to Chattanooga. The Commission said the facts of record did not sustain this contention.—"Traffic World."

Will Test the Legality of Some Association Practices

Eastern Cement Manufacturers Sued by Federal Government

ANNOUNCEMENT was made June 30 by Attorney General Daugherty that civil proceedings charging violation of the Sherman anti-trust law had been instituted in the Federal Court at New York City against the Cement Manufacturers' Protective Association, which is the district organization of portland cement manufacturers for the northeastern part of the country.

Mr. Daugherty said the proceedings would supplement criminal actions instituted last March and would not in any way stop prosecution of the pending criminal case.

Members of the association who would be named in the complaint, he said, are the Atlas Cement Co., Allentown Portland Cement Co., Alpha Cement Co., Bath Portland Cement Co., Copley Cement Manufacturing Co., Dexter Portland Cement Co., Edison Portland Cement Co., Giant Portland Cement Co., Glen Falls Portland Cement Co., Hercules Cement Corporation, Knickerbocker Portland Cement Co., Lawrence Co., Lehigh Portland Cement Co., Nazareth Cement Co., Penn-Allen Cement Co., Pennsylvania Cement Co., Phoenix Portland Cement Co., Security Cement and Lime Co. and the Vulcanite Portland Cement Co.

The suit resulted from revelations of the alleged price-fixing combinations by the Lockwood State Legislative Committee investigating housing conditions.

Association Officers Indicted

The defendant officers of the association were named as follows: President, E. P. Walker; vice-president, C. Raymond Hulsart; secretary, Miss M. B. Phalen; treasurer, Marion S. Ackerman.

Between 1908 and 1911, the complaint alleged, certain of the defendant corporations were organized together as members of the Association of Licensed Cement Manufacturers, and as such were required to sell cement at scheduled delivered prices which were uniform to any given point of delivery. The association was dissolved and abandoned by unanimous vote of the members about January 6, 1911, the complaint said.

From 1902 to 1915, it was alleged, there existed one large outstanding association known as the national association, to which all manufacturers of cement in the United States belonged.

The Portland cement industry by 1915, it was said, became one of such magnitude that it was determined that certain of its duties could more satisfactorily and expeditiously be performed by local sectional organizations. These were known as the Cement Manufacturers' Protective Association, with headquarters in New York City; the Midwest Cement Credit and Statistical Bureau, with Chicago headquarters; the Southern Audit and Statistical Bureau, headquarters, Dallas, Tex.; Norcross Audit and Statistical Bureau, headquarters, Kansas City, Mo., and the Southern Statistical Bureau, headquarters, Atlanta, Ga.

The Cement Manufacturers' Protective Association, also known as the Eastern Association, the complaint alleged, was organized in 1916 in New York, with offices in Philadelphia until April 1, 1918, when they were removed to New York.

The defendant corporations, since their affiliation with the national association in 1902, and the Eastern Association in 1916, the complaint alleged, had been engaged in a conspiracy and unlawful combination to restrain interstate trade and commerce in Portland cement in violation of the Sherman anti-trust law.

To Test "Open-Price" Policy

Attorney General Daugherty explained the nature of the two proceedings against the cement manufacturers by saying that in the criminal case the defendants may be fined or imprisoned or both, while in the civil case the court may order an effective dissolution of the combination and enjoin its members from forming any similar combination in future, thereby affording the public substantial relief.

"The decision to institute civil suit," he said, "was not reached until after a comprehensive investigation had been made and the facts ascertained had been carefully considered. The activities of the defendants have resulted in eliminating every semblance of the competition to which the public is entitled, which the law contemplates and which, but for the combination and conspiracy described, would exist between the defendants in the manufacture and sale of cement.

"It is not unusual to institute both criminal and civil proceedings against combinations charged with violations of the Shermen anti-trust act, and the bringing of this suit does not preclude the government in any way from vigorously prosecuting the pending criminal case. In a criminal case the defendants may be fined not exceeding $5,000, or imprisoned not exceeding one year, or both, in the discretion of the court.

"The Cement Manufacturers' Protective Association is organized along the lines of what have come to be generally known as the Eddy plan, the new competition, open price plan and open competition plan. The forms of these plans vary in minor details, but the outstanding and fundamental principle of all is the exchange between members of comprehensive statistical data which enable each to know what his competitors are doing. For some time past the investigation of every complaint of an alleged violation of the Sherman anti-trust act has invariably led to the door of one of these associations. The members of the association adopt a constitution and fill their minutes with disclaimers of any intention to violate the law. As soon as the association begins to function properly the price of the commodity in which its members are interested begins to advance and the customary signs of competition disappear."

Missouri State Cement Plant

BY THE MOST RECENT reports received, it looks very much as if the Missouri state legislature would enact the so-called Bowker bill, to set aside $2,000,000 of the $60,000,000 state highway bond issue for the construction of a state-owned and operated portland cement plant. A similar act, appropriating $5,000,000 of public highway money, has already become a law in Illinois.

The first section of the Bowker bill provides that with the approval of the Governor the Missouri State Highway Department may acquire by lease, purchase or condemnation, any land, mines, quarries or other property containing sand, gravel, clay, rock, mineral deposits or other road building or road maintenance material.

The next section provides that the Highway Department may, in the same manner, take over any plants and factories used or useful in the production or manufacture of sand, gravel, clay, rock, cement, brick or other road building or road maintenance material

The Highway Department is directed that, if it desires to condemn lands, it shall proceed under the same provisions of the law with reference to the condemnation of land for public highways or for railroad right of way.

This bill has passed the Missouri senate with only two dissenting votes. Some of its provisions appear to be obviously unconstitutional.

Fire Damages Fort Dodge Plant of U. S. Gypsum Co.

A REPORT from Fort Dodge, Iowa, dated June 29, states that a fire had partially destroyed the plant of the United States Gypsum Co., valued at $300,000. This plant was described in ROCK PRODUCTS, April 24, 1920.

Editorial Comment

A Sandles' Epitome

The quarryman buys land. Pays taxes. Strips from two to ten feet of dirt from top of stone. Pays high price for dynamite. Drills holes. Explodes. Pays compensation insurance of from $5 to $8 on every $100 paid out in wages. Hauls rock to crusher. Smashes machinery several times a year. Screens and grades the crushed stone. Elevates it to the storage bin. Loads stone into railroad car. Long, tedious task. The railroad hitches engine to car. When the car has been pulled twelve miles, freight rate is as much as quarryman is paid for stone.—A. P. Sandles in "Macadam Service."

The Railways Vs. Highways

The average producer of road-building materials apparently does not see the direct connection between freight rates on his materials and the road-building policy adopted by the national and state authorities. He generally takes no particular interest in road policies other than the policy of building as many miles of improved roads as the public will stand for. We doubt whether he is at all familiar with the various bills now before Congress for the continuation of Federal aid; or if he is familiar with them, gives very much thought to the very vital interests his industry may have in one as against another.

Probably the average producer thinks if he boosts good roads he boosts his own game. He may and he may not. In some instances he has undoubtedly helped to bring down on his head a load of freight-rate increases that, unless removed, will spell the ruin of his business. He admits the ruin of his business, but he fails to connect it with the road policy adopted by the state or nation, or agitated by the trade association of which he may be a member.

The railways need business. They know how they can get business. They know they can move some commodities at a good profit at much lower rates than those now in force. But in a great many instances they are not particularly anxious to move those commodities at any price, for those particular commodities are going into the construction of transportation lines designed to compete with their own lines on a very unfair basis.

An extreme example is the case of a railway in Arkansas which was assessed $7000 per mile on nearly 10 miles of right-of-way to build a competing highway. Fortunately it has won a decision from the United States Supreme Court which will save it from paying all this assessment. Nevertheless this is an example of what is happening everywhere to a lesser degree.

The case is a parallel to the assessment and taxing of producers to build a competitive plant at public expense and then turning that plant over to an operator free of charge or at a very nominal charge (such as the motor vehicle tax is in many instances). As a producer you know you would fight that kind of competition to the last breath in your body, or you wouldn't be worthy of the name of business man and citizen. Then don't blame the railways for fighting by every means possible competition brought into the transportation business in just that way.

Don't think, though, that the railways are opposed to road improvement. They certainly are not. In a great many cases they have gone the limit to encourage it. They know that a *properly designed* highway system builds up their business as nothing else can. But they don't enthuse over national or state *trunk-line* highways in our sparsely settled and under-developed Middle West and Western States. Such road systems are promoted in every case, in the last analysis, by selfish interests who have axes to grind at the railways' expense and public's expense.

Therefore, if you would ask the railways to be fair with you in the matter of freight rates, play fair with them. Don't lend your assistance or moral support, either active or passive, to high-sounding schemes for trunk-line highways. The farmers do not want them. They want *farm-to-market* roads. In fact, nobody who produces commodities from nature wants them. What *they want* is access to markets and shipping points. Those who do want these trunk lines do not have in view a development of our great natural resources; they have solely selfish interests to promote—or they are good intentioned people misled by cant phrases of patriotism and so-called public interest.

Our country has the most magnificent system of railways in the world. It is not being worked today to half its capacity. Yet certain people are scheming for a highway system that will duplicate the railway system. No student of transportation believes for an instant that highway transportation can ever compete with railway transportation on anything but very short-haul business. Every transportation expert knows that it is an economic crime to subsidize highway transportation to the extent of hundreds of millions of dollars out of the public pocketbook to take business that should go to the railways. That is one cause of high freight rates.

God knows this country needs more transportation. It needs good roads and much more of them than all the money now available can ever build. But let those roads be built to serve the economic needs of the country—to supplement, not duplicate, a railway system with which highways can never compete except on an unsound and uneconomic basis. If you, Mr. Material Man, would boost for *that kind* of highways you would get more sympathy from your railway friends—and you would be a public benefactor.

Review of Eastern Markets

WHILE CONSTRUCTION WORK in the New England district is far behind the totals of a year ago, the tone of affairs continues on an upward trend. There are a number of important operations developing at Boston and other leading cities in this section, and inquiries at the supply dealers are growing more numerous. There is a considerable amount of alteration and improvement work, also, and while individually these are small the aggregate is rounding out a fair total.

Roadbuilding operations are a main center of attraction for the crushed stone and gravel markets in this territory, and a fair distribution of material is going forward for this account. Washed sand is also picking up with increased outlets, and the general aspect of the situation in the rock products industry has its bright spots.

Crushed stone in truckload lots is priced at $3 per ton at the different material yards, while a good grade of sand for mortar purposes is selling for $2.50 a yard; beach sand is quoted at $4 a ton, delivered. Washed gravel is being turned in retail quantities at $2.75 a yard.

Portland cement holds at $3.90 a barrel, or without bags at $3.50, delivered. The reduction that has taken place at New York in connection with this material has not as yet affected the Boston market, but indications seem to be for a slight shading in the figure at an early date. In paper sacks, cement is being sold at $3.75 a barrel.

Common lime is quoted at $3.20 and $4.50 at the supply yards, for 180-lb. and 280-lb. barrels, respectively. Finishing lime, in same size containers, is selling for $3.40 and $4.75 in each instance. Common hydrate lime, in paper, is being retailed at $20 a ton, and finishing material at $27. Sanded mortar plaster is fetching $20 a ton, and fiber mortar plaster, $24. Regular calcined plaster, in 250-lb. barrels, is being delivered at $5.50.

Prices are holding firm at Providence, R. I., with cement well established at $4 a barrel, less bag allowance of 7½ cents. Hydrated masons' lime is priced at 70 cents per bag of 50 pounds, and hydrated finishing at 75 cents for the same size container. Barreled lime in 180-lb. barrels is selling for $3.25 a barrel, and for 280-lb. net barrel, $4.50. Sanded wall plaster is being sold at $21 a ton in this section, and wood fiber material at $24. Neat wall plaster in 100-lb. cloth sacks is priced at $24.

New York City

There is an encouraging volume of new construction work in sight in the New York district, and straight contract operations are growing more pronounced. As set forth in the last issue of ROCK PRODUCTS, the bulk of work is centered in new apartments and dwellings, and there is little change expected throughout the summer season. Industrial work is at a very low point.

The call for building materials, particularly in the stone and gravel lines, is on the increase, and from the producers' and dealers' standpoint the outlook is far better than a month ago. In the Long Island sand-producing sections, including the Cow Bay district, there is a brighter attitude, and a fair rate of production is going forward.

The matter of wages is now coming to the front in the metropolitan district, and employers have made demands on workers in the building industry for a reduction of $1 a day; otherwise, a reduction of from $2 to $3 a day is threatened before the close of the year. The men are voicing a protest and it looks as though extended negotiations will be necessary before a settlement is reached.

In the local material markets the trend in prices is downward, and the situation lacks the stability that is necessary for rigid figures. Cement has declined 20 cents a barrel, making a quotation of $3, less bag rebate of 10 cents. Fair sized quantities of material are being turned, and the lower figure undoubtedly will help in this respect.

Building sand is holding at $1.80 a cu. yd., delivered, with some dealers asking a shade or two higher. Gravel is selling for $4.25 a cu. yd., both for 1½ and ¾-in. sizes, while crushed stone is priced at $4 a cu. yd.

The wholesale markets are operating without much interest and prices remain substantially the same. Sand is $1.25 in carload lots, as compared with a figure of $1.50 a year ago this time. Gravel, ¾-in. and 1½-in., is priced at $2.50 in cargo lots, while crushed stone holds at $1.90 for small size material, and $2.15 for 1½-in. material. Warehouse prices on lump lime in 200-lb. barrels are around $3.50 for finishing lime, and $3.30 for finishing material.

Conditions in the Lehigh Valley

With road work coming along at a better status, improved conditions are noticeable in the Lehigh Valley section of Pennsylvania, and there is marked betterment in the general sentiment among the producers. A number of the plants are now making shipments close to normal, and with orders coming in at a better pace it seems likely that this condition will prevail for some weeks to come. The distribution is making for decreased stocks, which have been accumulating since spring. The average for the past fortnight is close to 150 carloads of material a day.

The large mills are continuing production, including the Atlas Portland Cement Co., Lehigh Portland Cement Co., and the Alpha Portland Cement Co., and no change in operations has ensued during the past fortnight. The Coplay Cement Co. at Coplay is on the producing list and additional machinery has just been placed in service for increased output.

At Egypt, the Giant Portland Cement Co. has a force of repairmen and laborers at work, cleaning up and making necessary improvements in equipment. This mill, known as the Central Mill, has been idle for close to a year past and the indications are that it will be placed on the producing list at an early date. The company has been maintaining active production at its Reliance mill and no change here is anticipated.

A test case instituted by the Coplay Cement Co. against the Pennsylvania Power & Light Co. has been decided in favor of the utility, reversing a decision of the lower court, recently made in favor of the cement company. The case at issue covers an action of the power company in increasing its rates, while a complaint against a prior increase remained undetermined. The Public Service Commission upheld the request of the company to enforce the advance charge and appealed from the decision of the lower court that such was not legal. The Supreme Court now sustains the company in its action. With the decision the other way, cement companies in the Lehigh Valley section would have had many millions of dollars refunded for increases imposed during the war.

High Freight Rates—Poor Aggregates

The high price of slag in the different Pennsylvania sections, and primarily at Philadelphia, is having the effect of causing the substitution of cinders in cement mixtures, with the result that considerable work of this character is being done at below standard. The material is priced at 90 cents a ton, with transportation costs of $1.13 a ton, and the latter figure has gone far to check the use, for in ordinary construction it has made the price prohibitive.

General Market News

Los Angeles Municipal Cement Plant Sold

THE HISTORY of another public enterprise is closed. The city of Los Angeles has at last disposed of its municipal portland cement plant. It has been sold to the United States Potash Co., which is now operating the plant under a lease. This company is supposed to make potash as the principal product and portland cement as a by-product.

Under the sale agreement it is provided that this year's total rental of $22,500 shall apply on the purchase price of $450,000. The purchase contract provides that the sum of $450,000 shall be paid in certain installments and that the Public Service Commission "shall have the right to take a part of such purchase price in cement at a price equivalent to the cost of manufacturing and delivery plus 10 per cent of such cost."

Record Price for Gypsum Deposit

A DISPATCH from Riverside, Calif., states that what is believed to be the largest mining deal made in that county for a decade was terminated there recently when County Recorder Fred Dinsmore received for record a deed from the Avery Gypsum Co. to the United States Gypsum Co. for several pieces of patented mining claims located about 18 miles northwest of Blythe.

Attached to the deed was $998 worth of revenue stamps, showing the consideration to be $998,000.

The deed arrived at the recorder's office this morning from the law firm of Scott, Beneroft, Marton and Stephens of Chicago. Included in the transfer are a number of parcels of real estate.

Mentioned in the deed are the claims known as the Annie, Byrle, Ellan, Dora, Fannie, Gertie, Helen, Irving, John, Kern, Lewis Noble and the Oregon Placer mining claims.

Roofing Granules from Augite Rock

THE Rock Products Co. has just recently built a plant at Easton, Pa., where it is manufacturing roofing granules made from an unfading augite rock found in that locality. This rock is a magnesium aluminum silicate of a very hard texture. The plant is so constructed that while making this roofing the larger aggregates are separated out for stucco and terrazzo in standard sizes Nos. 1, 1½ and 2.

The Rock Products Co. has also just completed a plant at serpentine quarry where it has one of the largest deposits of green serpentine found in this country. This plant is designed so as to produce the various standard sizes of "granito" and terrazzo as well as the stucco size in various shades of green consisting of "yellow-green," "light-green," "ever-green," "royal-green" and so-called "Irish-green" which is practically translucent in color and of semi-precious nature.

This company is also operating a large grinding plant in the city of Phillipsburg. It is operated by electric and water power from the Morris Canal. Here various grades of magnesium silicate are produced, some of which are very white in color and are used as fillers for paint, paper, etc. The company is also producing what was known for years as the "Warne China Clay" and various other grades of talc.

St. Louis Material Producers Sued in State Supreme Court

QUO WARRANTO PROCEEDINGS were instituted in the Supreme Court in banc on July 7 by the Missouri State Attorney General against 14 corporations comprising the membership of the St. Louis Manufacturers and Material Dealers' Association. The suits are similar in every respect to the quo warranto actions brought recently by the Attorney General against the 15 firms and corporations comprising the Millmen's Association of St. Louis.

All of the suits are the result of the probe conducted by the Attorney General into the prices of building materials in St. Louis.

The petitions allege that all of the firms and corporations have entered into and participated in a pool, trust, agreement, combination and confederation and have an understanding among themselves and each other which tends to and does result in the restraint of lawful trade and full and free competition in the manufacture and sale of building materials in this State, with the design and purpose to regulate, fix and control the price of the same.

It is asked that each of the corporations against which the quo warranto is filed be deprived of its charter and corporate rights, and that they be fined in such sums as the court determines should be paid for their offense against the laws of the State.

The producers named in the proceedings against the Manufacturers and Material Dealers' Association are all corporations that do an extensive business outside of St. Louis. The list includes these well-known firms:

Continental Portland Cement Co., Meremac Portland Cement Co., Centaur Lime Co., Glencoe Lime and Cement Co., Hunkins-Willis Lime and Cement Co., Missouri Portland Cement Co., St. Louis Material and Supply Co., Wabash Stone Co.

Price Cuts in St. Louis

A REDUCTION of 10 cents a barrel for cement and 10 cents a ton for Mississippi River sand and gravel delivered in St. Louis and St. Louis County was announced recently by the Missouri Portland Cement Co. and the Hunkins-Willis Lime and Cement Co. These prices were effective July 1.

The net price of cement under the reduction ranges from $2.37 a barrel to dealers to $2.95 a barrel by the truck load. The new price of sand ranges from $1.50 to $2.55 a ton, and gravel from $1.50 to $2.40 a ton.

Gordon Willis, president of the Hunkins-Willis Lime and Cement Co., predicted a further reduction in the price of building material very quickly if the wage scales of building mechanics and laborers were decreased sufficiently to stimulate new construction.

"I know of $10,000,000 in building projects that will get under way within a week if the building workers will accept a uniform wage scale of $1 an hour, instead of $1.25 now demanded," Mr. Willis is reported to have said. "Such a reduction in labor prices would increase the volume of our business to such an extent we would be able to further cut our prices, because of the reduction in the overhead cost of producing a barrel of cement or a ton of sand or gravel."

Palmer Lime and Cement Co. Plant to Be Sold at Auction

AN ADVERTISEMENT on page 48 of this issue of Rock Products announces the sale at public auction on August 5, 1921, of the plant and quarry of the Palmer Lime and Cement Co., York, Pa. The advertisement states that the reason for the sale is to close the estate of Lowell M. Palmer. The company is one of the oldest and best known in the lime industry.

Accident Prevention

Oiling Devices and Oilers

(Prepared by the Engineering Department of the National Safety Council for Rock Products)

PROGRESS in the art of harnessing power has brought with it increasing danger of severe injury and death to the attendants. Safety engineers have realized the hazards thus developed and a number of efficient devices and methods have resulted—some of them patented.

Shafting

Oiling of shafting should be done, whenever possible, while the machinery is at rest. Better still, the bearings may be fitted with automatic lubricators which need to be filled periodically and then, when the shafting is not in motion.

Sometimes shafting requires attention while in motion and safe means of access should be provided for this purpose. The following means are suggested:

(a) A service platform or runway provided with guard rails and toe boards running parallel with shafting. Moving parts of machinery should not be allowed to project in or cross this runway, but if this is unavoidable, such parts should be enclosed.

(b) A ladder provided with hooks or hangers to fit over the shaft at the upper end and equipped with spurs or safety feet.

(c) The use of a car hung from an I-beam along the shafting, this rail or beam being suspended from the ceiling.

(d) The use of an extension forced feed oil can, which can be operated from the floor.

Direct Oiling

Direct oiling of shaft journals is dangerous and wasteful of material. Self-oiling devices, when practicable, should be installed and carefully maintained.

Oiling Systems

Avoid accident hazards by providing adequate oiling facilities when installing new oiling systems. In the operation of these devices it should not be necessary for oiler to place himself in dangerous proximity to running shafting.

In many plants workmen of special training and long experience are designated to inspect and oil shafting previous to the regular starting time of the plant. This plan has not always proved satisfactory as oilers are sometimes late or delayed in their work, and, should the engineer start machinery while the oiler is engaged in his duties, a serious accident may follow. This hazard can be guarded against, however, where disconnecting appliances permit cutting off the section the oiler is working on, by the oiler cutting out that section and pad-locking the appliance so that it cannot be thrown in. If such appliances are not installed a safe practice is to require that the oiler report personally to the engineer to see that the machiney he is going to work on is cut out and that the controlling mechanism is pad-locked. He should again report to the engineer when the work is completed.

Automatic Lubricators

In view of the fact that several state laws prohibit the oiling of shafting while in motion the use of automatic lubricators seems the most feasible method of inaugurating safe practices in this work.

23,175

Men Saved from Death or Serious Injury by One Company in Twelve Years!

THIS GIGANTIC SAVING in men effected by one concern practicing Safe methods in manufacturing represents a saving in dollars that is stupendous.

With them accident prevention is an "operating department" which pays dividends at the rate of about one million dollars annually.

What they have done—you can do. Your actual savings in dollars would be smaller perhaps, but your percentage of saving would be the same. Accident hazards throughout like industries are constant factors.

This company was one of the pioneers in the Safety Movement—one of the organizers and a charter member of the National Safety Council.

Today the National Safety Council offers you the accumulative experience of this concern and four thousand others. And in addition, an educational and news service that is setting the pace for accident prevention activity the world over.

Write today for details on membership.

National Safety Council

Co-operative—Non-Commercial

168 North Michigan Avenue, Chicago, Ill.

Automatic lubricators are often designed to carry a supply of oil sufficient to meet requirements for several weeks or even months. Descriptions of several types of satisfactory automatic devices are given herein. One of the most popular of the patented devices is known as the "capillary oiler," of which there are several. The theory of their construction and a description of their workings follow:

This capillary oiler is a wooden block, with alternate saw cuts through which the oil rises by capillary attraction from the reservoir to the shaft. The law of capillary attraction is definite and positive, and can be relied upon. The capillary oiler is self acting, and takes care of itself. Once in six months drain off the old oil from the reservoir and clean the bearing; then refill the reservoir with new oil, and the bearing will do its work without further attention.

The capillary oiler is a non-agitating oiler. There is not the slightest whipping and churning of the oil. The oil remains in a quiet condition in the reservoir. Sediment is permitted to settle at the bottom and only the good, clean oil is brought up to the shaft. There is no clogging of the saw cuts in the oiler.

Ring and Capillary Oiling Rigid Pillow Blocks and Bearings

The methods of lubrication are positive.

The oil reservoirs are large and shaft wipers return the oil to the resevoir, when it has worked out to the end of the bearings.

One filling of the reservoir will last for several months.

The elimination of constant attendance in oiling the bearings saves a considerable labor charge, and eliminates also that risk of accident and injury to workmen which always exists when men are compelled to work around a rapidly revolving shaft.

Bearings can be secured with dustproof ends, which prevent dust and grit from getting into the bearing surface, when installed in dusty and dirty places.

Ring Oil Bearings

Ring oil bearings are also considered an excellent type, as they are efficient, convenient, reliable, and are probably safer than many other types of self-oiling devices. Rings should revolve with the shaft, constantly feeding oil to the bearings in regular quantities. Permanent devices are used to return surplus oil to reservoirs. A heavy oil should not be used as it is likely to clog and prevent the free rotation of rings.

When necessary to fill reservoirs of self-oiling bearings while shafting is moving, care should be used to avoid filling reservoir to full capacity. While a shaft revolves, considerable oil is in the bearing around the shaft. When the shaft stops much of this oil runs down into the reservoir. If the reservoir is already full it will overflow.

(To be continued)

New Machinery and Equipment

Compressed Air Transport for Powdered Coal

BELOW IS PRESENTED a diagrammatic sketch of a powdered coal handling system that was recently installed at the Mount Vernon street power plant of the Philadelphia Rapid Transit Co. The key which accompanies the sketch here reproduced from "Electric Railway Journal" makes it practically self-explanatory.

The Quigley system, of which this installation is typical, differs essentially from the screw conveyor and high-pressure system in that the fuel is transported in bulk from the pulverizing plant by small steel pipes without the use of return piping. It is not carried in suspension, but is similar to liquid flow.

The fuel is dumped from a car located on the siding and, after passing through a crusher is elevated to a magnetic separator where the tramp iron is removed. It then passes to the crushed fuel bin, from which it is automatically fed to a rotary drier and then carried by a bucket elevator to the dry fuel bin. Then it goes automatically to the pulverizer and the pulverized fuel bin.

From this bin the pulverized fuel is fed into the blowing tank, a quick reading scale indicating the amount in the tank. The fuel thus automatically weighed is forced by compressed air in proper quantities through the transport bins. The fuel supplied to each burner is governed by a controller with hand wheels. Combination air is regulated by a blast gate.

The fuel pulverizing plant may be located at the point most convenient for the fuel supply and the powdered fuel can be economically distributed to furnace hoppers at widely separated points. Delivery has been effected by this method for distances exceeding 1,500 ft. The Quigley Furnace Specialties Company has a record of 2,800 lb. of pulverized fuel having been carried 600 ft. through a 4-in. pipe in one minute under the air pressure averaging 15 lb. gage.

From the furnace bins the fuel passes through a dust-tight gate into an especially designed fuel feed controller, which regulates the fuel feed into a low pressure siphon. This siphon carries it, with about one-seventh of the air necessary for combustion, into the burner, where it is mixed at very low pressure with the quantity of air necessary.

A feature of interest is the blowing-tank unit, which consists of special equipment for storing, feeding and weighing the powdered fuel and transporting it to the points of consumption.

The tank is of cylindrical steel construction, and it is connected with the pulverized-fuel bin by means of a flexible connection. A control gate located immediately below the bin is now operated from the floor.

A valve in the head of the tank admits the pulverized fuel in any quantity desired and is operated by a conveniently placed lever. As mentioned before, the scale upon which the tank is mounted is provided with a quick-reading dial. When the desired amount of fuel has been let into the tank, the charging valve is closed, compressed air is admitted and a shut-off valve on the transport line is opened.

The controller consists primarily of a cast-iron box containing a feed screw, driven at constant speed by a gear or pulley, and adjustable shutters operated by a handwheel which give a suitable opening, under control, leading to the discharge head.—"Compressed Air Magazine."

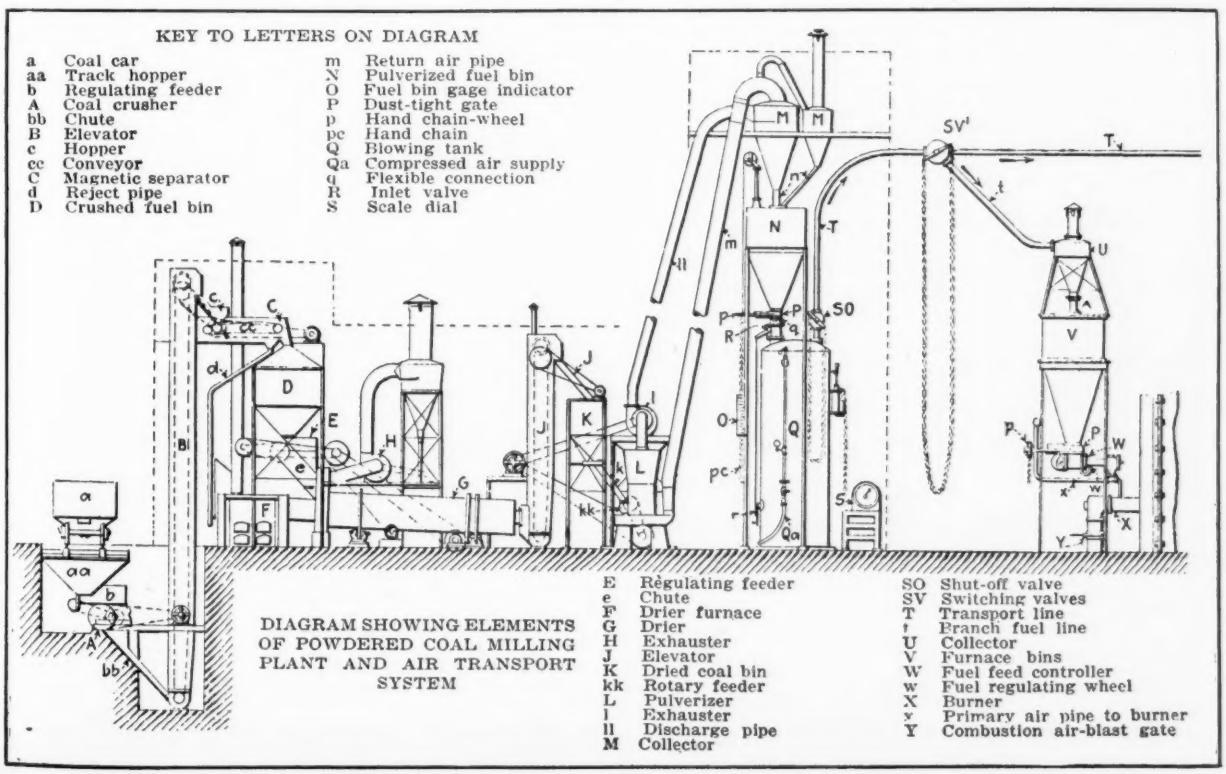


DIAGRAM SHOWING ELEMENTS OF POWDERED COAL MILLING PLANT AND AIR TRANSPORT SYSTEM

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.35	1.35	1.25	1.25	.....
Buffalo, N. Y.			1.30 per net ton, all sizes			
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	1.75	1.75	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton, all sizes			
Eastern New York	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.00	.....	1.85	1.85	1.85	1.85
Munns, N. Y.	1.00		Other sizes 1.50			
Walford, Pa.	1.40	1.60	1.75	1.75	1.60	1.60
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.50	.....	.....
Bettendorf, Ia.		All sizes, 2.00 cu. yd. f.o.b. quarry				
Brillion, Wis.	1.00	.....	1.20	1.00	1.00	.....
Buffalo, Ia.	1.00	1.35	1.45	1.25	1.35	1.35
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Greencastle, Ind.	1.50	1.35	1.25	1.10	1.10	1.10
Illinois, Southern	1.75	1.60	1.60	1.60	1.60	.....
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montrose, Ia.	1.35	1.75	1.75@1.85	1.75	1.65@1.75	.....
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	1.50	1.65	1.65	1.50	1.50	1.50
Sheboygan, Wis.	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10
Southern, Illinois	1.75	1.60	1.50	1.50	1.50	.....
Stolle, Ill. (I. C. R. R.)	1.75	1.60	1.60	1.50	1.50	1.50
Stone City, Iowa	.80	.....	1.40	1.35	1.30	.....
Toronto, Canada	1.90	2.40	2.40	2.40	2.15	2.10
SOUTHERN:			These prices include 90c freight			
Cartersville, Ga.	.....	1.85	1.60	1.60	1.60	.....
Chickamauga, Tenn.	1.00	1.00	1.25	1.00	1.00	1.00
Chico, Texas	1.10	.....	1.25@1.50	.....	1.25	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Fort Springs, W. Va.	1.55	1.70	1.75	1.75	1.50	.....
Garnet and Tulsa, Okla.	.....	.....	1.60	1.60	1.45	.....
Ladds, Ga.	1.75	1.75	1.75	2.00	2.00	.....
Portland, Ga.	.75	2.00	1.50	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.65	1.60	1.50	1.40	1.30
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	2.00	2.00	2.00	2.00	2.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.95	1.80	1.60	1.40	.....
Bound Brook, N. J.	2.00	2.30	2.00	1.70	1.60	.....
Dresser Jct., Wis.	1.00	2.45	2.45	2.30	2.00	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.40	1.40
Dwight Station, Calif.			.75@1.00—all sizes			
E. Summit, N. J.	2.10	2.35	2.15	1.75	1.75	.....
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.60	2.25	1.95	1.80	1.80	1.70
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	.....
Oakland, Calif.	1.75	1.75	1.50	1.50	1.50	1.50
Richmond, Calif.	.50*	.....	1.75*	1.50*	1.50*	.....
San Diego, Calif.	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.40	2.10	1.80	1.75	1.75
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Ableman, Wis.	1.60	.....	1.30	1.50	1.20	.....
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Berlin, Wis.	1.60	.....	1.40	1.50	1.30	.....
Columbia, S. C.—Granite	.75	.....	2.75	2.50	2.35	.....
Dell Rapids, S. D.	1.00	.....	2.10	2.10	2.10	.....
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Eastern Penna.—Sandstone	1.10	2.00	2.00	1.70	1.70	1.70
Eastern Penna.—Quartzite	.90	1.70	1.55	1.30	1.30	1.10
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.	1.60	.....	1.30	1.50	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	2.00
Middlebrook, Mo.—Granite	3.50@4.00	.....	.....	2.00@2.25	.....	1.25@1.75
Red Granite, Wis.	1.60	.....	1.30	1.50	1.20	.....
Sioux Falls, S. D.	1.00	.....	2.00	2.10	2.00	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
Utley, Wis.	1.60	.....	1.30	1.50	1.20	.....

*Cubic yard. †Agrl. lime. ||R. R ballast. ‡Flux ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.50; bulk 2.75

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.75% $CaCO_3$, 1.20% $MgCO_3$ — 70% thru 100 mesh; 80 lb. ppr., 5.50; bulk 4.50

Hillsville, Pa.—70% thru 100 mesh; sacks, 4.75; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Syracuse, N. Y. — Analysis, 90% carbonates—50% thru 100 mesh, 90% thru 50 mesh; sacks, 3.50; bulk 2.75

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Walford, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$ — 90% thru 100 mesh; paper bags, 6.25—90% thru 50 mesh; paper bags, 5.25; bulk 3.25

West Stockbridge, Mass.—Analysis, 95% combined carbonates; 33% thru 200 mesh, 66% thru 100 mesh, 100% thru 20 mesh; sacks 5.25@5.50; bulk 3.25

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 3-4% $MgCO_3$—50% thru 50 mesh; paper, 5.50; bulk 4.00

CENTRAL:

Alden, Ia.—Analysis, 99.16% $CaCO_3$ ..... .80

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—50% thru 4 mes. 4.50

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Buffalo, Ia.—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 90% $CaCO_3$, .044% $MgCO_3$—50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh 1.50

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh 2.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Marblehead, O.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—52.4% thru 100 mesh, 59% thru 50 mesh, 100% thru 10 mesh; sacks, 5.25; bulk 3.00

Limestone screenings; bulk 1.50

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, 93.10% $CaCO_3$, 3.2% $MgCO_3$ — 24% thru 200 mesh, 33.2% thru 100 mesh, 40% thru 50 mesh, 50% thru 40 mesh, 70% thru 20 mesh 1.65

Mitchell, Ind.—50% thru 100 mesh 2.00

Montrose, Ia.—⅛-in. 1.35

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.50@1.75

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh ..... 3.25@5.00

50% thru 50 mesh ..... 1.75@2.00

Ridgeville, Ind.—Analysis, 98% $CaCO_3$ 100% thru 4 mesh 1.75

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40

Spring Valley, O. — Analysis 95.92% $CaCO_3$, 2.15% $MgCO_3$; 100% thru 10 mesh, bulk 3.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ⅛-in. mesh—Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75
Stone City, Ia.—Analysis, 98% $CaCO_3$—90% thru 50 mesh ..... .80
Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50
Whitehill, Ill.—Analysis, 97.12% $CaCO_3$, 2.50% $MgCO_3$—90% thru 100 mesh 5.00
50% thru 50 mesh 2.00

SOUTHERN:

Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh 4.75
Cartersville, Ga.—Analysis, 96% combined carbonates—pulverized limestone ..... 1.75@2.00
Claremont, Va. (Marlime)—Analysis, 90% $CaCO_3$, 2% $MgCO_3$—90% thru 50 mesh; bulk 3.50
Dittlinger, Tex.—Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh ..... 2.00@3.00
90% thru 4 mesh ..... 1.00@2.00
Grovania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh 2.50
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCO_3$; bulk 2.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh 2.00
90% thru 50 mesh 1.50
Ladds, Ga.—Pulverized limestone 2.50
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk 3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$.
80% thru 100 mesh 3.00
All thru 10 mesh 2.50
80% thru 200 mesh 5.00
Paper bags, $1.50 extra per ton; burlap, $2.00 extra per ton.
Maxwell, Va. 2.50
Mountville, Va.—Analysis, 76.6% $CaCO_3$, 22.83% $MgCO_3$—100% thru 20 mesh; 100 lb. ppr., 7.00; bulk 5.00
Ocala, Fla.—Analysis, 98% $CaCO_3$—75% thru 200 mesh 4.50

WESTERN:

Colton, Calif.—Analysis, 95% $CaCO_3$, 1½% $MgCO_3$—all to pass 14 mesh; bags, 6.50; bulk 5.50
Sacks, 15c extra, returnable.
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk 2.00
Terminus, Calif.—Analysis, 96.2% $CaCO_3$, .04% $MgCO_3$—60% thru 200 mesh, 90% thru 100 mesh, 95% thru 50 mesh, 100% thru 4 mesh; sacks, 6.00; bulk 5.25
Tulsa, Okla.—90% thru 4 mesh ..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Beach City, O.—Washed and screened 3.00
Berkeley Springs, W. Va. ..... 2.25@2.50
Cedarville and South Vineland, N. J. 2.00
Cheshire, Mass. ..... 5.00@7.00
Columbus, Ohio ..... 2.50@3.00
Gray Summit, Mo. ..... 2.50@4.00
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo. ..... 2.50@3.00
Mapleton, Pa.—Dry 2.75
Glass, damp 2.25
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, Ohio 3.00
Montoursville, Pa.—Green, washed ..... 1.50@2.00
Morgantown, W. Va. ..... 3.00@3.25
Oregon, Ill.—Large contracts 1.75
Ottawa, Ill. ..... 1.25@2.25
Pittsburgh, Pa.—Dry, 4.00; damp 3.00
Rockwood, Mich. ..... 3.25@3.50
Round Top, Md.—Damp 2.00
St. Marys, Pa.—Green 2.50
Thayers, Pa. ..... 1.75@2.00
Utica, Ill. ..... 1.75@2.25
Zanesville, Ohio 2.50

FOUNDRY SAND:

Albany, N. Y.—Glass and sand blast ..... 2.00@7.00
Core ..... 1.50@2.50
Furnace lining ..... 2.50@3.00
Molding fine, coarse and brass ..... 2.00@2.75
Allentown, Pa.—Core ..... 1.50@1.75
Molding coarse ..... 1.50@1.75
Arenzville, Ill.—Molding fine ..... 1.40@1.60
Beach City, O.—Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse ..... 2.25@2.50
Bowmantown, Pa.—Core ..... 1.35@1.50
Molding, coarse ..... 1.80@2.00
Cleveland, O.—Molding coarse ..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Buffalo, N. Y.	1.10	.95	.85	.85	.85	.85
Erie, Pa.		1.00	1.65		1.75	
Farmingdale, N. J.	.48	.48			1.40	
Hartford, Conn.	**.90**		**1.25**	**1.15**	**1.15**	**1.15**
Leeds Junction, Me.		.60@ .75	2.00	1.75	1.65	1.50
Ludlow, Mass.	**.75***	**.75***	**1.70**		**1.50***	**1.50***
Philadelphia, Pa.	.75	.75		1.65	1.50	
Pittsburgh, Pa.		1.30	1.30	1.30	.85	.85
Portland, Maine		.50	1.75		1.35	1.35
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.60@ .75	.60@ .75	2.00	1.40	1.20	1.10@1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.50		1.00		1.00
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.60	.60		.60	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, O., and vicinity	.65	.60	.85	.85	.85	.85
Columbus, O.	.90	.90@1.25	1.25	.90@1.25	.90@1.25	.90@1.25
Des Moines, Ia.	.90	.65	1.60	1.60	1.60	1.60
		25% gravel, .90; 50% gravel, 1.15				
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.50	.50	1.00@1.25	1.00	1.00	
Elgin, Ill.		.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Estill Springs, Ky.	1.15	1.15		1.00		.90
Grand Rapids, Mich.		.55		.90	.85	.85
Greenville, Mechanicsburg, O.	.80	.70	.80	1.00	.85	.80
Hamilton, O.		.90			.90	
Hawarden, Ia.		.70			1.60	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Le Mars, and Doon, Ia.		.90		1.80		
Libertyville, Ill.		.75		.75		
Lincoln, Neb.		Sand .40, sand and gravel .80, drained for shipment				
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.35@ .50	.35@ .50	1.50	1.50	1.50	1.25@1.50
Moline, Ill.	.70	.70	1.20	1.20	1.10	1.10
Oxford, Mich.		.25		.60	.50	.50
Riton, Wis.		.40			.60	
St. Louis, Mo., f. o. b. cars	1.60	1.65	1.80	1.60		1.55
Summit Grove, Clinton, Ind.	.90	.90	.90	1.00	1.00	1.00
Terre Haute, Ind.	.75	.75	1.25	1.00	.85	.85
Winnipeg, Man.	1.90	1.90		3.25		2.85
Winona, Minn.	.70	.60	2.00	1.75	1.50	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.		.60@ .80	.70@ .80	.70@ .80	.70@ .80	.60@ .80
SOUTHERN:						
Alexandria, La.	.60@ .90					1.65@1.85
Charleston, W. Va.			Sand 1.40—Gravel 1.50			
Ft. Worth, Tex.	2.00@2.25*	2.00@2.25*	2.75@3.00*	2.75@3.00*	2.75@3.00*	
Greenville, Miss.		1.10				1.00
Jedburg, Mo.		1.05	1.20	1.00	1.00	.95
Knoxville, Tenn.	1.15	1.15		2.15	1.95	1.75
Lake Weir, Fla.		**.75**				
Macon, Ga.		.75@1.00				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.30	1.30		1.40		1.00
New Orleans, La.	**1.00**		**1.75**		**1.25**	
Pine Bluff, Ark.	1.25	.92	Washed gravel, all sizes, 2.30			
Roseland, La.				1.25		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.25*	1.00*			1.50*	
San Diego, Calif.		.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50*	1.50*	2.00*	1.50*	1.50*	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10*			1.00		
Dudley, Ky. (Crushed Sand)		1.05				
Elkhart Lake, Wis.			Washed gravel .66			
Fishers, N. Y.	.65@ .85	.75@ .85				.65@ .85
Ft. Jefferson, Mechanicsb'g, O.	**.70**	**.60**	**.60**			
Glenville, N. Y.				1.00*		
Hamilton, O.			6 in. and less, .20 per ton			
Hartford, Conn.		1.00*				
Hersey, Mich.				.60	.60	.60
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Janesville, Wis.		.65			.65@ .75	
Lindsay, Tex.						.60
Oxford, Mich.					.50	
Pine Bluff, Ark.			Road gravel .60			
Roseland, La.		.75				
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand 1.70			
Summit Grove, Ind.	.65	.65	.65	.65	.65	.65
Valde Rouge, La.						.85
Waco, Texas		.80		1.50		1.30
Yardville, N. J.		.50@ .75				
York, Pa.		1.10@1.20		(crushed rock sand)		

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey		1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania		1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.40		other grades 1.75@2.00				
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.95@1.00	.85@ .90
Longdale, Goshen, Glen Wilton & Low Moor, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		8.00	58 to 65	0.5 to 1.0	
Bellefonte, Pa.	8.50		98.2	.72	11.50
Berkeley, R. I.			**50**	**18**	**15.00**
Branchton, Pa.		5.50			
Cassadaga, N. Y.—Marl		8.00@10.00	48.07	1.08	
Chippewa, Pa.	5.50		78.67	1.33	
Hot Springs, N. C.	3.00	4.50			
Lime Ridge, Pa.	5.75		80.56-62.71	3.87-1.96	
Lime Ridge, Pa.	6.00@7.50		80.56-62.71	3.87-1.96	
Paxtang and Lemoyne, Pa.	5.50		63	3	
Rockland, Maine		8.00	65	1	
Rosendale, N. Y.	7.00		84	7	(bulk) 6.00
Union Bridge, Md.	11.00	5.50	73	1	13.00
Williamsport, Pa.	6.00	10.00	75	3	10.00
West Rutland, Vt.	4.50	7.50	68	3	
West Stockbridge, Mass.					15.00
Williams and Blue Bell, Pa.		8.25	57	33	11.25
York, Pa.	7.50		92	3	10.50
CENTRAL:					
Alton and Hannibal, Ill.	11.50		.95		
Delaware, O.			50.0	5-12	10.00
Knowles and Valders, Wis.	5.00	9.00	55	45	12.50
Marblehead, O.			85.10	12.92	9.50
Mitchell, Ind.					12.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Woodville, Ohio			48	33	9.25
SOUTHERN:					
Burns, Tenn.	9.50		96	0.54	12.00
Claremont, Va. (Marl.)	5.00	7.00	85-95	2-5	
Erin, Tenn.	7.50@10.00		97.82	0.12	
Karo, Va.	8.50		97	1.25	
Knoxville, Tenn.	9.00		98.23		13.00
Staunton, Va.	7.50	8.75	70	10	
WESTERN:					
Colton, Calif.			**97**	**2**	**15.00**
Kirtland, N. Mex.	12.00				
San Francisco, Calif.			98-99	.5-.75	19.50
Tehachapi, Cal.	12.00@15.00	14.00@17.00	98	1.00	

Miscellaneous Sands

(Continued from preceding page)

Columbus, O.—Core	.60@2.50
Brass molding	2.50
Sand blast	5.00@5.50
Glass sand	3.00
Molding, fine and coarse	2.00@2.25
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Core	1.50
Molding fine and coarse	1.50
Brass molding	1.50
Dunbar, Pa.—Glass sand No. 2, damp	3.00
Traction, damp	2.75
Dundee and Chalfants, O.—Sand blast	3.00
Glass, core and traction	2.75
Molding fine and brass molding	2.25
Furnace lining	2.50
Molding coarse	2.00
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.00@4.25
Traction sand	.50
Falls Creek, Pa.—Glass sand, washed	2.50
Core sand, washed or unwashed	2.00
Furnace lining, unwashed	2.00
Molding fine, washed	2.00@2.50
Molding coarse, washed or unwashed	2.00@2.50
Sand blast, washed	3.50@4.50
Stone sawing, washed	2.00@2.50
Traction, washed	2.00@2.50
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.00
Molding fine	2.25
Molding coarse	2.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	1.50@1.70
Howard, O.—Glass sand	3.00@3.25
Steel molding	2.25@2.50
Joplin, Mo.—Stone sawing and roofing	1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and stone sawing	1.65
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding coarse and brass molding	2.00@2.75
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Massillon, O.—Glass sand, molding fine and coarse, core, and furnace lining	3.00
Traction	3.00
Michigan City, Ind.—Core, glass, traction and brass molding	.60
Millington, Ill.—Glass, core, furnace lining, roofing and stone sawing	1.75
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	2.25
Montoursville, Pa.—Core	1.25@1.50
Traction	1.00@1.25
Brass molding	1.50@1.75
New Lexington, O.—Molding fine	2.25
Molding coarse	2.00
Sand blast	3.00
Glass, core and traction	2.75
Furnace lining	2.50
Brass molding	2.25
Oregon, Ill.—Core and glass sand	2.00
Furnace lining	2.00

Miscellaneous Sands

(Continued)

Molding fine and coarse	1.00
Sand blast	3.50
Stone sawing	2.00
Ottawa, Ill.—Crude silica sand	1.00@1.25
Core, molding, fine and coarse	1.00@2.25
Furnace lining	1.25@2.00
Roofing and traction	1.25@5.00
Sand blast	4.00@5.00
Stone sawing	1.50
Ottawa, Minn.—Core	2.00@2.50
Glass, molding coarse, roofing, stone sawing (all crude silica)	1.25
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core	2.75@3.00
Roofing	3.50
Sand blast	3.50@4.00
Round Top, Md.—Glass sand, core and roofing sand; washed, damp	1.75@2.00
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	1.75
Furnace lining	1.00
Molding fine and coarse	1.00
Core, green	1.50@1.75
Tulsa, Okla.—Sand blast	6.50
Utica, Ill.—Core and furnace lining	1.25
Molding, fine and coarse	1.00
Stone sawing and roofing	1.25
Sand blast	3.50@4.50
Traction	1.75
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	2.50
Same, green	2.25
Wedron, Ill.—Core (crude silica)	1.00@1.25
Molding fine and coarse	1.00@1.25
Furnace lining	**1.25**
West Albany, N. Y.—Molding fine	**2.25**
Molding coarse	**2.25**
Winnipeg, Man., Can.—Roofing sand	**4.00**
Zanesville, Ohio—Molding fine and Brass	2.25
Molding coarse	2.00
Furnace lining	2.50
Glass, core and traction	2.50
Sand blast	2.75
Steel molding	2.50
Pulverized silica thru 140 mesh	8.50
Thru 200 mesh	9.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	50.00
Blanks, per lb.	.02
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh), bulk, 10.50@12.00; bags	12.00@14.00
Emeryville, N. Y.—150-200 mesh; bags	14.00
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Gouverneur, N. Y.—Crude talc	4.00
Ground talc (150-300 mesh)	17.00@24.00
Hailsboro, N. Y.—Ground Talc (150-200 mesh)	15.00@20.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.25
Ground talc (20-50 mesh), bags, 7.00@7.50; bulk	5.50@ 6.00
Ground talc (150-350 mesh); bags, 9.50@11.25; bulk	8.00@ 9.75
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	8.50@15.00
(Bags extra)	
Keeler, Calif.—Ground talc (200-300 mesh), bags	18.75@32.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (20-50 mesh) 200-lb. bags	12.00
Ground talc (150-200 mesh) 200-lb. bags	8.00@10.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@15.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.50
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$8.10
24x14	9.30	8.40	8.10	8.10
22x12	10.72	8.70	8.77	9.10
22x11	10.72	8.70	8.77	9.10
20x12	10.72	8.70	8.77	9.10
20x10	11.70	9.60	9.42	9.42
18x10	11.70	9.60	9.42	9.42
18x 9	11.70	9.60	9.42	9.42
16x10	11.70	9.60	9.42	9.42
16x 9	11.70	9.60	9.42	9.42
16x 8	11.70	9.60	9.42	9.42
18x12	11.05	9.30	9.10	9.10
16x12	11.05	9.30	9.10	9.10
14x10	11.05	9.30	8.77	8.77
14x 8	11.05	9.30	8.77	8.77
14x7 to 12x6	10.40	9.00	8.45	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.50	$5.75
22x11	9.10	7.75	7.75	5.75
Other sizes	9.10	8.10	8.45	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50.

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Bound Brook, N. J.—Trap rock, carload lots; bulk		2.30
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	10.00@15.00	10.00@15.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@35.00	20.00@25.00
Milwaukee, Wis.		20.00@30.00
Missouri river points — Different colors	20.00@25.00	20.00@25.00
Piqua, O.—Marble	8.00@10.00	8.00@10.00
Sioux Falls and Red Granite, Wis.	7.50	7.50
Tuckahoe, N. Y.—White marble	7.00@12.00	12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	.....
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	.....
Wisconsin and S. Dak. points—Granite, different colors, bulk or sacks	1.50@ 2.00	3.00@ 7.00
Granite dust in bags	6.00	.....

Crushed Gypsum

Akron, N. Y.	3.50
Blue Rapids, Kan.	3.50
Castalia, O.	3.50
Centerville, Ia.	3.50@4.20
Ft. Dodge, Ia.	3.50@4.00
Grand Rapids, Mich.	3.50
Gypsumville, Man., Can.	3.50
Oakfield, N. Y.	4.00
Gypsum, O.	3.50
Port Clinton, O.	4.50
Rapid City, S. Dak.	5.00
Saltville, Va.	4.50
Winnipeg, Man., Can.	5.50

(Gypsum) Land Plaster

Akron, N. Y.	4.50
Blue Rapids, Kan.	4.50
Castalia, O.	6.00
Bags extra—Jute 3.00; ppr., 1.00.	
Centerville, Ia. (bags extra)	4.50@7.00
Ft. Dodge, Ia.	4.50
Garhutt, N. Y.—Bags extra	7.50
Grand Rapids, Mich.	4.50@7.50
Gypsum, O.	4.50
Mound House, Nev.	7.50@8.00
Sacks, .25 extra.	
Oakfield, N. Y.	7.00
Los Angeles, Calif.	12.50

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	6.00@7.00
B.P.L. 70% to 75%	6.00@9.00
Mt. Pleasant, Tenn.—B.P.L. 75%	8.00@9.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00
Wales, Tenn.—B.P.L. 70%	6.00@8.00

Ground Rock

Per 2000-lb. Ton

Centerville, Tenn.—B.P.L. 70%—90% thru 100 mesh	9.00@10.00
B.P.L 75% (brown rock)	12.00
Mt. Pleasant, Tenn — B.P.L. 68%—13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.00@9.00
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Lakeland, Fla.—B.P.L. 72%	13.50
B.P.L. 60%	6.00

Concrete Brick

Prices given per 1,000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00@20.00	28.00@36.00
Bellow Falls, Vt.	20.00	35.00
Bridgeport, Conn.	31.00	32.00
Buffalo, Niagara Falls and Rochester, N. Y.	21.00	.....
Eau Claire, Wis.	20.00	30.00@40.00
Houston, Tex.	.....	22.00
Lockport, N. Y.	17.00	.....
Milwaukee, Wis.	17.00@18.00	35.00@150.00
Omaha, Neb.	32.00	42.00
Piqua, O.	18.00	25.00
Portland, Ore.	25.00	43.00@73.00
Fancy brick	100.00@150.00	
St. Paul, Minn.	15.00	32.00
Springfield, Ill.	18.00	20.00@25.00
Tonawanda, N. Y.	20.00	.....
Virden, Ill.	18.00	20.00@25.00
Winnipeg, Man., Can.	19.00	40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	8.00
Barton, Wis.	14.00
Bloomfeld, Ont.	16.00
Brighton, N. Y.	17.00
Buffalo, N. Y.	16.50
El Paso, Texas	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	13.50
Lancaster, N. Y.	14.50
Michigan City, Ind.	11.00
Miller, Ind.	10.00@10.50
Milwaukee, Wis. (delivered at job)	17.50
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.—Common	15.00
Face	25.00
Redfield, Mass.	15.00
Saginaw, Mich.	14.75
San Antonio, Texas—Common	16.00
Face	24.00
South Dayton, Ohio	14.50
Syracuse, N. Y. (delivered at job)	20.00
F. o. b. cars	18.00
Toronton, Can.	15.00
Washington, D. C.	14.50
Winnipeg, Can. (less $1 trade disc.)	16.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	21.00	17.00
Baltimore, Md.	22.25	17.50
Boston, Mass.	22.25	21.25
Cincinnati, Ohio	16.70	14.50
Chicago, Ill.	20.00	.....
Dallas, Tex.	27.50	25.00
Denver, Colo.	.....	16.00
Detroit, Mich.	22.00	19.00
Los Angeles, Calif.	.....	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	30.00	.....
New Orleans, La.	.....	17.00
New York, N. Y.	21.00	19.00
St. Louis, Mo.	26.00	20.00
San Francisco, Calif.	24.40	22.00
Seattle, Wash.	27.00	.....

	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	1.60	1.50
Baltimore, Md.	(ton)	12.75
Boston, Mass.	3.50	3.25
Cincinnati, Ohio	(ton)	14.50
Chicago, Ill.	.....	1.75
Dallas, Tex.	.....	3.00
Denver, Colo.	3.00	.....
Detroit, Mich.	2.00	1.80
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.80	1.50
Montreal, Que.	15.00	(ton)
New Orleans, La.	2.75	2.00
New York, N. Y.	3.50*	3.30*
St. Louis, Mo.	.....	2.50*
San Francisco, Calif.	.....	2.25*
Seattle, Wash.	3.25	.....

* 280-bbl. (net).

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags:

Atlanta, Ga.	2.60
Baltimore, Md. (del.)	3.58
Birmingham, Ala	3.05
Boston, Mass.	2.86
Cedar Rapids, Ia.	2.51
Cincinnati, Ohio	2.62
Cleveland, Ohio	2.43
Chicago, Ill.	2.17
Dallas, Tex.	2.60
Davenport, Ia.	2.47
Denver, Colo.	3.10
Detroit, Mich.	2.43
Duluth, Minn.	2.10
Indianapolis, Ind.	2.43
Kansas City, Mo.	3.20
Los Angeles, Calif.	3.31
Milwaukee, Wis.	2.39
Minneapolis, Minn.	2.41
Montreal, Que.	3.44
New Orleans, La.	3.36
New York, N. Y.	2.40
St. Louis, Mo.	3.00
San Francisco, Calif.	3.09
Seattle, Wash.	3.10

NOTE—Add 40c per bbl. for bags.

Gypsum Products—Carload Prices Per Ton—F. O. B. Cars, Without Bags

Mills	Crushed Rock	Ground Gypsum	Agri. Gypsum	Stucco Calcined Gypsum	Cement* and Gauging Plaster
Oakfield, N. Y.	3.50	4.50	7.50	9.00	11.00
Plasterco, Va.	4.50	.....	7.00	9.00	11.00
Gypsum, Ohio	3.50	4.50	7.50	9.00	11.00
Alabaster, Mich.	3.50	4.50	.....	.....	.....
Grand Rapids, Mich.	3.50	4.50	7.50	9.00	11.00
Fort Dodge, Ia.	3.50	4.50	7.50	9.00	11.00
Blue Rapids, Kans.	3.50	4.50	7.50	9.00	11.00
Piedmont, So. Dak.	.....	.....	7.50	9.00	11.00
Loveland, Colo.	3.50	4.50	7.50	9.00	11.00
† Southard, Okla	3.50	4.50	7.50	9.00	11.00
† Eldorado, Okla.	.....	.....	.....	.....	11.00

* Bond Plaster $1.50 per ton additional.
† Acme, Tex. Freight rates govern.
(NOTE: Returnable Jute Bags— 15c each—$3.00 per ton extra. Paper Bags—$1.00 per ton extra)

News of the Industry

Incorporations

The Wisconsin Lime and Cement Co., Chicago, Ill., has increased its capital stock from $200,000 to $1,000,000.

The Canton Sand and Gravel Co., Canton, Ohio, has been incorporated for $25,000 by Peter Miller and J. L. Alman.

The Providence Sand and Gravel Co., New York City, has been incorporated with a capital of $100,000 by G. V. Reilly, H. C. Hand and S. B. Howard. The attorney is S. Ryan, Albany, N. Y.

The Progressive Cement and Tile Sales Corporation, Dover, Del., has been incorporated for $100,000 by C. H. Jarvis, L. B. Phillips, M. F. Vance. The new company will manufacture concrete products of all kinds.

The Rosoff Sand and Gravel Corporation, New York City has been incorporated for $500,000 by J. Ewan, J. J. Ward and S. B. Vreeland. The attorneys are Wilder, Ewan and Patterson, 45 Cedar St., New York City.

Quarries

The Texas Stone Products Co., Dallas, Tex., has increased its capital stock to $240,000.

F. H. Hoffman and H. J. Hughes, Trenton, Mo., have established a limestone crushing and pulverizing plant, specializing in agricultural ground limestone.

The Thousand Islands Granite Corporation, Clayton, N. Y., with a capital of $1,250,000 will develop extensive granite deposits at Grindstone, N. Y. The quality of the stone is such as will make it suitable for monumental purposes.

The Leathern D. Smith Stone Co., Sturgeon Bay, Mich., has established headquarters in Muskegon, Mich., with John Wallsman in charge. The increased volume of business expected this season was the reason for establishing a headquarters there.

The J. B. Nelson Quarry Co., Houston, Tex., is planning for the establishment of a new marble and granite quarry in the vicinity of Llano, Tex., estimated to cost about $200,000 with machinery. The company has acquired the quarry property of the Steward Brothers Co.

Petaluma, Calif.—The quarries and rock crushers at Point Pedro, Calif., have been closed down and it is not known when they will reopen. The heads of the different departments are still at the Point and much of the manufactured stock is being shipped to the bay cities but none of the wheels are turning. The reason has not been given out but it is presumed that the closing down is in line with the readjustment of wages.

Sand and Gravel

The Boston Sand and Gravel Co., Boston, Mass., has declared its regular quarterly dividend of 1¾ per cent on its preferred stock.

R. R. Menton & Co., Camden, Tenn., have leased what is locally known as the Atkins Hill sand and gravel deposit. A track is being put in to connect with the Louisville, Chattanooga and St. Louis R. R. and a plant will soon be erected.

Frank L. Cole, Waterloo, Iowa, has asked for an injunction to restrain H. C. Matthias and the Iowa Sand Co. from removing sand, gravel and stone from the bed of the Cedar river, claiming he has an exclusive right from the Waterloo River Front Improvement commission to engage in that activity. The application for the writ states that Mr. Cole entered into a contract with the commission to have the exclusive right to take sand, gravel and stone from the Cedar anywhere within the confines of the city. He states that the defendants have bought a dredge and have set it up a short distance below the Sans Souci bridge with the intention of removing materials from the river bed. The contract referred to, which was entered into in April, 1920, provides that Mr. Cole shall pay 4 cents a cubic yard for all materials removed, but must not pay less than $750 a year, regardless of how little material is removed.

Cement

The Huron Portland Cement Co., Detroit, Mich., it is reported, will begin construction August 1 on another 5000-bbl. mill at Alpena. The new plant will bring the total capacity of the Huron company up to 10,000 bbls. per day.

The Three Forks Portland Cement Co., Trident, Mont., has paid the state treasurer $10,000 as a sales tax of 4 cents per barrel on 250,000 bbls. of cement made and sold since January 1. The cement company, it is reported, will contest the constitutionality of the law.

The United States Potash Co., Los Angeles, Calif., which recently purchased the municipal cement plant of the city of Los Angeles, has placed on the market a portland cement under the brand name "Monolith Plastic Waterproof Cement." It is manufactured by a process patented in 1918 by Hans M. Olson, chemist of the company.

The Southwestern Portland Cement Co., El Paso, Tex., has been awarded the contract for cement for 17 miles of concrete road in Maricopa County, Arizona, at a price of $3.72 per bbl. net, delivered. There were three other bidders on the cement. The contract price for the road itself was 20 per cent less than the price for which this county let $4,000,000 worth of concrete roads last year.

The Acme Portland Cement Co., Alsen, N. Y., according to a local dispatch has put a full force at work Monday, and is showing the phenomenon of starting into special activity right in the midst of the usual summer dullness. This is an excellent indication of activity in the cement business, which has undoubtedly set in and is likely to be unprecedented in the history of that business in this country. The company is grinding clinker and, as an evidence of large shipments at hand, is building a large dock on the river and improving the access thereto, and also moving the big crusher nearer the road. The present management of the Acme Company is showing readiness to take advantage of opportunity and is being very successful in securing orders and preparing to fill all demands.

The Monarch Portland Cement Co., Humboldt, Kans., is reported to have curtailed operations until August 1 on account of general business conditions. Of 178 employees on the payroll only 30 remain. The plant has a quantity of finished product in storage sufficient to take care of present demands. Exorbitant freight rates are responsible, more than anything else, for closing down the industries of the country. The decrease in the price of all building materials is offset by the high freight rates, and this has about ruined the progress in the building program. The country is several years behind with building and construction work of all kinds. H. F. G. Wulf, president of the Monarch, assisted a number of Monarch employees in securing work in western Kansas harvest fields. Fifty of the men have gone to Garden Plains since the first of the week to work in the wheat harvest. Their families will remain and they will return to work at the plant when it resumes operation August 1st.

Lime

The Blue Diamond Plaster Co., Los Angeles, Calif., has just issued a folder entitled "Plaster Splatters." Here are two "Splatters": "A knocker never wins—and a winner never knocks.' "Hating a competitor merely because he is a competitor is about as sensible a thing as hating the minister because he married you."

Phosphate Rock

The Montana Phosphate Co., Maxville, Mont., at a meeting of the stockholders recently elected the following officers: F. J. Russell, president; F. A. Bryant, vice-president and F. F. Irwin, secretary-treasurer. The new board of directors is: Burt Willark, Lawrence Hauck, R. R. McLeod, J. H. M. Florey, L. J. Groth and H. J. Cole.

Concrete Products

The Adamson & Graham concrete brick plant, Barrie, Ont., recently constructed, is now in operation and turning out a good grade of brick. The brick is manufactured in two colors, red and gray.

The Dayton Adis-Tile Co., Dayton, Ohio, is constructing a factory for the manufacture of all kinds of concrete products. The company specializes in the manufacture of a building tile under the name "Adis-Tile."

The Parmenter Construction Co., Columbus, Kan., will soon complete its new concrete products factory which will when complete employ about 35 men. The company plans to manufacture about 30,000 concrete bricks a day as well as other concrete products. L. Alfred Nisely, former manager of the Bankers Investment Co., Joplin, Mo., has been employed as general manager of the company.

Fuller's Earth

The Riverside Fuller's Earth Co., Riverside, Texas, has opened offices in Houston, Texas, in the Queen Theater Bldg. with F. S. Nesmith in charge. The company's plant located at Riverside, seventy-five miles north of Houston, has a daily capacity of seventy-five tons of fuller's earth.

Personal

J. H. Allen, Lincoln, Neb., has sold his interests in the Nebraska Material Co., and also in the Lincoln Sand and Gravel Co., to Victor W. Krause.

H. H. Gilmore, of the Universal Portland Cement Co., Pittsburgh, Pa., has been temporarily transferred to company headquarters in Chicago, Ill.

J. S. Molloy, formerly with the American Cement Plaster Co. at their Ft. Dodge, Iowa, plant is now with the Centerville Gypsum Co., Centerville, Iowa, as their mill manager.

R. T. Weston, Ithaca, N. Y., has tendered his resignation, effective July 1, 1921, as superintendent of the Pennsylvania Portland Cement Co.'s plant at Portland Point, N. Y.

A. P. Hachtmann has been appointed to succeed L. C. Harvey as European manager of the Fuller-Lehigh Co., with headquarters at 25 Victoria St., London, England. Mr. Hachtmann was mechanical engineer of the company for a number of years.

Fred M. Randall, of Detroit, Mich., has been elected president of the National Cement Co., with executive offices in that city. This company is capitalized at $2,000,000 and is building a new plant near Mt. Pleasant, Mich., costing $900,000. Mr. Randall has been a member of the board of directors for some time, and this advancement is a recognition of his unusual executive ability.

Jas. B. Bragassa, Tulsa, Okla., announces that he has sold his interests in the Hughes Stone Co., Garnett, Okla., to Messrs. J. M. Chandler, W. A. Moore and F. T. Glasscock. The announcement continues: "In retiring from the stone business in this locality, I desire to express to you my full appreciation of the business you have extended and also of your friendship and confidence, which I have endeavored to merit, and I shall treasure the thought of our very pleasant dealings with both yourself and your good company. The new stockholders will continue to operate the Hughes Stone Co. under the present plant management to maximum capacity with the views of serving you most advantageously, and it is with great pleasure that I bespeak a continuance of your business with them, especially because of the fact that the new owners are high-class business men of unquestionable integrity."

Obituary

J. Dan Heck, Chicago, Ill., vice-president of the Illinois Lumber and Builders Supply Association, died on June 4.

Rock Products

The Only Journal With a Paid Circulation in the Rock Products Industry

BUYERS' BULLETIN

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

The Sandhills Co., 101 Leith Walk, Leith, Scotland, desires catalogs on the following equipment: Transmission belting, brick machinery, cableways, conveyors, crushers, elevators, car and wagon loaders, sand pumps, screening equipment, steam shovels and track materials.

The Wallace Stone Co., Bay Port, Mich., are in the market for a portable compressed air outfit for air drilling on a 14 ft. face of limestone; also want air drill catalogs.

Pond Hill Stone Co., M. J. Gallagher, Wapwallopen, Pa., desires catalogs of portable gas air compressors and steam air pumps to supply air for jackhammer drill.

R. P. Lang, Farmington, Mo., desires catalogs and prices on dragline loading equipment for gravel loading.

Rockfield Products Co., Rockfield, Wis., wants information on fire box for rotary dryers for drying limestone.

Walter Jensen, 227 N. E. 25th St., Miami, Fla., is in the market for a hoist.

The North Carolina Granite Co., Mt. Airy, N. C., wants prices on 5 H.P. 220-volt motor with starter.

The Appalachian Marble Co., Knoxville, Tenn., is in the market for a traveling crane with steel runway of 30-ton capacity.

J. G. Tilley Co., 316-20 Kirby St., Bristol, Va., write as follows: "We want catalogs and information on machinery for pulverizing manganese ore and separating the ore from the other material."

Wm. Wentland, R. F. D. No. 1, Box 16, Woodville, Mich., wants to hear from manufacturers of cement block machinery.

L. B. Applegate, Aroca, Jefferson Co., Ky., wants catalogs and data on the following equipment: Air compressors, blast hole drills, conveying equipment, crushers, elevators, air drill hose, pulverizers, screening equipment, valves and oxy-acetylene welding equipment.

R. McC. Beanfield, Asst. Supt. Don Pecho Dam, Turlock, Calif., wants catalogs on the following: Bagging machines, bins and bin gates, cableways, car pullers, crushers, derricks, dump cars, elevating equipment, gears, car loaders, power transmitting machinery, screening equipment, sand washing boxes and wire rope.

Buffalo Sandstone Brick Co., 189 Fillmore Ave., Buffalo, N. Y., desire catalogs and prices on bins and bin gates.

Shank & Etzler, Frederick, Md., want prices and catalogs on elevating equipment.

H. A. Prindle, 101 Park Ave., N. Y. City, will shortly be in the market for dragline equipment.

Fillmore Gravel Co., Fillmore, Okla., desire catalogs and prices on conveyor belting, dump cars and dump wagons and gravel screens.

Second Hand Equipment Wanted

Paul H. Jamison, Box 405, Roanoke, Va., is in the market for a second-hand stone outfit, capacity 100 tons in ten hours, including crusher, elevator, screens, hoists, etc.

The Templeton Limestone Co., Kittanning, Pa., write as follows: "Our plant at Templeton, Pa., was completely destroyed by fire yesterday (June 23). We are in the market for conveyors, bins, belting, engines, etc. Do you know of any such equipment that could be purchased second hand?"

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

2—Model 28 Marion Revolving, ⅝-yard dippers.
1—Model O Thew Revolving, ½-yard dippers.
1—Type "B" Erie Revolving, ¾-yard dippers.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
2—12-ton, 9x14" Porter Dinkeys, 36" gauge.
1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.
40—Western 4-yard, 36" gauge, steel beam.
10—Western Dump Cars, 2-yard, 36" gauge.

H. KLEINHANS COMPANY

Union Arcade **Pittsburgh, Pa.**

NO. 8-D, GATES GYRATORY CRUSHER

STANDARD DRIVE

Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

1 New, Manganese head.
1 New, set of manganese concaves.
1 New, main shaft.
1 New, Spider, and 2 New, eccentrics.

We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg., New York, N. Y.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3" 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; **4½x20', 5x11', 5x20', 5½x22' and** 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; **one Kent type "G" mill; 36" and** 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 **Sturtevant ring roll crusher; 3 roll and** No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, Richardson **automatic scales.**

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

One 50-ton, standard gauge Baldwin Mogul; 170 lbs. pressure.

One 56-ton, standard gauge American 10-wheeler; 175 lbs. pressure.

Two 50-ton, standard gauge Brooks 6-wheel switchers; 160 lbs. pressure.

One 42-ton, standard gauge Shay geared locomotive.

One 24-ton, standard gauge Shay geared locomotive.

One 14-ton, 36" gauge American Saddle Tank.

Two 23-ton, brand new 36" gauge Porter 6-wheel switchers; separate tenders.

One Model 14-B Bucyrus Shovel.

The above are only a few items of our stock. Will gladly send you our complete stock lists.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Bargains in Real Rebuilt Machinery

Air Compressors—Steam, size 150 to 3000 cu. ft. Belt driven, 147 to 1250 cu. ft. (2nd hand).
Air Receivers—36" to 84" diameter (new and used).
Boilers—8 H. P. to 500 H. P. (new and used).
Boiler Tubes—All sizes.
Engines—Steam, gas and oil, all sizes.
Electrical Equipment—Motors, generators, transformers. All motors are for 3 phase, 25 cycle, 220 or 2300 volt.
Gasoline Locomotives—All sizes.
Hoists—Single and double drums, steam and electric.
Pumps—Plunger, steam and electric.
Crushers, Rolls and Elevator Equipment for rock crushing plants.
Full Line of Mine and Mill Supplies.
Large Stock of New Solid Octagon, Red Star Drill Steel at 25 per cent less than present mill price.

Send for Complete Stock List

Landreth Machinery Company
JOPLIN, MISSOURI

New Rubber Belting

300 ft. 12" 6-ply	$0.99	per foot
423 ft. 14" 5-ply	1.04	per foot
527 ft. 14" 6-ply	1.25	per foot
529 ft. 16" 6-ply	1.39	per foot
520 ft. 16" 8-ply	1.90	per foot
150 ft. 18" 6-ply	1.48	per foot
512 ft. 18" 8-ply	2.00	per foot
216 ft. 24" 8-ply	3.15	per foot

Rolls Cut to Any Length

National Belting and Salvage Company
268 East Water Street Milwaukee, Wis.

Immediate Delivery

6, 7½, 9, 10 and 18 K Crushers

18 K ANGLE DR. $11,000.00.
No. 4 GYRATORY CRUSHING PLANT, N. Y.
No. 36 DISC CRUSHER, MANG. FITTED.
2—150-Hp. 125-lb. Marine type boilers and others.
No. 10 McCULLY—BARGAIN, $6,750.00.
4 No. 6 Gates (Mang. Fit.) nickel steel shafts.
50- and 75-Hp. single drum hoists for motor drive.
No. 2, 3 and 4 Gates, reg. drive crushers.
Air Compressors (steam-belt) 50 to 4000 ft.
5, 6 and 12 ton, 24-in. gauge gasoline locomotives.
1—8x8 and 10x10 Air Comp. (belt).
2—180-ft. Quick Shift, 30-ft. bucket towers.
6-in., 8-in. and 10-in. SAND PUMPS.
25—40-Hp. Thomas D. D. Elec. Hoist, 440 V. A. C.
5,- 10- and 15-ton HOLT TRACTORS, PRAC. NEW.
1, 2 and 3 DRUM STEAM AND ELEC. HOISTS.
Send us your inquiries—Sand Pumps, Motors, Contractors' Equipment, etc.

ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

WANTED

To purchase double truck second hand locomotive crane of standard make with fifty foot boom. State condition and price. Address

Box 1494, care Rock Products

New—RAILS—Relaying

All sections on hand for quick shipment Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

Locomotives for Rent and Sale

2—32-ton Vulcan four-driver saddle-tank, used sixty days, built March, 1921.
1—40-ton 17x24" four-wheel switcher.
2—50-ton 18x24" six-wheel switchers.
2—NEW 25-ton six-wheel Porters, separate tenders, 36" gauge.
2—18, 14, and 10-ton Vulcans, 36" gauge.

MISCELLANEOUS

13—6-yd. rebuilt dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794.
1—Marion 36 steam shovel on traction wheels.
1—Marion 76 steam shovel, No. 3503, std. gauge.
2-in., 4-in., and 6-in. simple, duplex, and centrifugal pumps, new 3-drum hoists, road rollers, and tripod drills.

Locomotive-Cranes, Railway Equipment, etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building, Chicago, Ill.

"Everything for the Quarry"

3-ton Plymouth 4'x8½" gauge Gasoline Locomotive.
10x16 cyl. 36-in. gauge Porter Saddle Tank.
9x14 cyl. 36-in. gauge Vulcan Saddle Tank.
7x12 cyl. 36-in. gauge Davenport Saddle Tank.
⅝-yd. Thew "O" Traction Shovel.
10—24-in. gauge 1½-yd. Western Dump Cars.
6—3-yd. Koppel 36-in. gauge Dump Cars.
15—36-in. gauge 4-yd. Western Dump Cars.
3—16-yd Western Air Dump Cars.
33-in. R. H. Lehigh Fuller Mills.
7x10 and 8x10 D.C. D.D. Hoisting Engines.

Rails, Track Material, Steam Shovels, Tanks

ZELNICKER IN ST. LOUIS

Send for bargain list—Bulletin 290

WANTED

1—2½ yard Steam Shovel Dipper for 70 ton Bucyrus Shovel.

Leathem D. Smith Stone Co.
STURGEON BAY, WIS.

Classified Advertising

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Plant for Sale

WE ARE NOW DISMANTLING

1500 Barrel Cement Plant at Stockertown, Pa. All equipment and land for sale.

Engineering Sales Company
Nashville, Tenn.

Situations Wanted

SUPERINTENDENT

Desires engagement; twenty years' experience; thoroughly familiar with heavy production and steam shovel operation, crushing plants and gravel plants. References. Address

Box 1489 Care Rock Products

Help Wanted

WANTED

A man capable of taking charge of an agricultural and 200 mesh limestone plant. No quarrying or blasting. State references and salary desired in first letter.

Box 282 Care of Rock Products

Situations Wanted

Engineer Available

Exceptional Experience Grinding and Preparation of Industrial Rock Products

Barytes, Feldspar, Carbons, Mica, Flint, Calcite, Whiting, Graphite.

Part or Whole Time

Address Box 1000, Rock Products, 101 West 41st Street, New York, N. Y.

Maddox Foundry & Machine Company
ARCHER, FLORIDA

Manufacturers of the

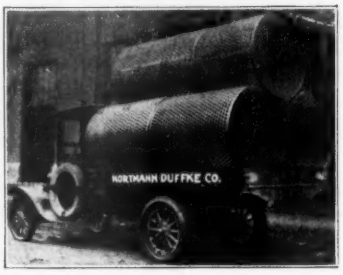
Abbott Improved Crusher Feeder

Indispensable where clay or sticky material is mined.

We manufacture washing, crushing and drying machinery for phosphate and lime rock, suction and dipper dredges.

We contract for complete plants.

PERFORATED SCREENS



We have the technical knowledge and the equipment that enables us to meet your most exacting needs quickly.

NORTMANN-DUFFKE CO.
1200 27th Ave.
MILWAUKEE, WIS.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Derricks—Hoisting Engines

For derricks, hoisting engines and material handling equipment, write us and save money. We have in stock derricks 8″x8″ three tons to 20″x20″ thirty tons capacity. Also 70 hoisting engines and car pullers, one, two and three drums, friction drums, reversible, handle 5000 pounds on single line. Pumps, rock drills, crushers, cars, cable, rope, blocks, etc. $500,000 stock.

Wilson Machinery Company
331 West 35th St., Chicago

SEVERAL BELT BARGAINS

98 ft. 24″ 4-ply Rubber-Covered Conveyor Belting, slightly used.....$1.50 per foot
100 ft. 30″ 8-ply Canvas-Stitched Belting, slightly used.....$1.62 per foot

NATIONAL BELTING AND SALVAGE CO.
268 East Water St., Milwaukee, Wisconsin

Steam Shovel for Sale

Thew, Type "O," ⅝-yd. dipper, full revolving, traction wheels, overhauled, painted, new tubes in boiler, first class operating condition. Price $3500 F. O. B. Campbell, York Co., Pa. Subject to prior sale.

YORK VALLEY LIME & STONE CO.
YORK, PA.

Two Sauerman Draglines

Have just released two outfits, a 1¼ cu. yd. and a 1½ cu. yd., complete, with hoists, boilers, pumps, pipeing, cables, settling tanks, etc. Full details and prices furnished on request.

THE UNDERWOOD-WALKER CO.
1822 Jefferson Bank Bldg. Birmingham, Ala.

20—3-yard, side dump, 36″ gauge Oliver Tram cars.
14—1½-yard, side dump, 36″ gauge all steel tram cars.
12—1-yard, side dump, 36″ gauge all steel tram cars.
1—Sparta Number 30 oil or well drill rig complete.
2—48″ diam. by 24′ long American Process dryers.

Address

E. W. COOPER, ENGINEER
174 3rd Ave., No. Nashville, Tenn.

AUCTION SALE

to close the Estate of Lowell M. Palmer, Dec'd

The Lime Quarry and Plant and Chalk Manufacturing Plant at York, Pa.

belonging to said Estate, will be sold by Public Auction in one parcel to the highest bidder complying with the terms of sale, without reserve, on

Friday, the 5th Day of August, 1921, at 12 M.

On the premises
BY ORDER OF

THE EQUITABLE TRUST COMPANY OF NEW YORK

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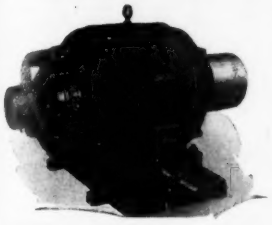

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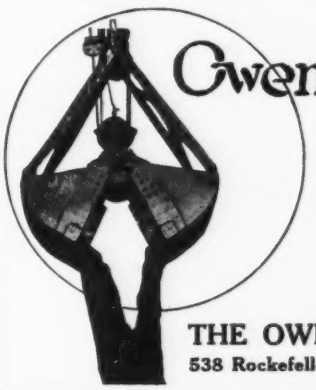

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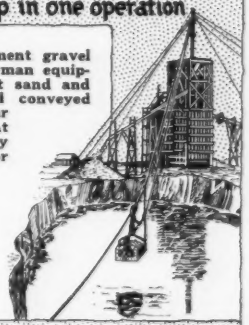

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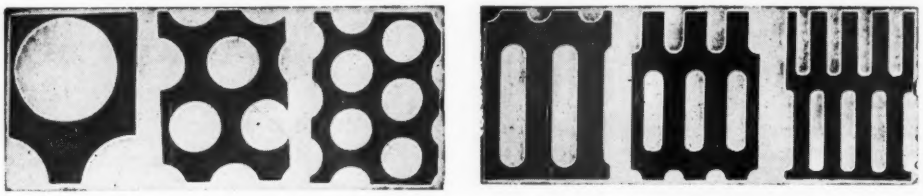

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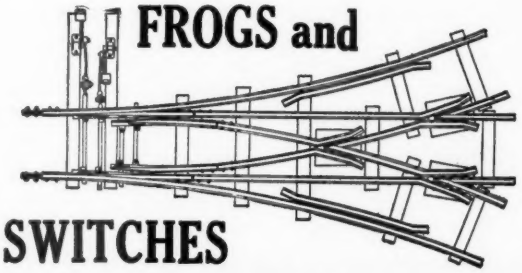

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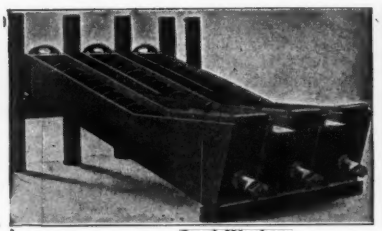

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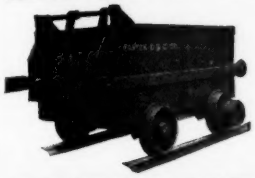

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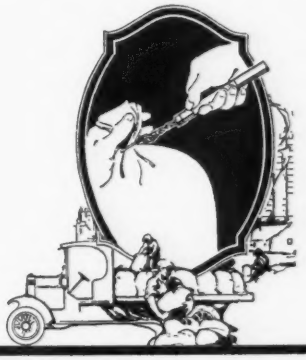

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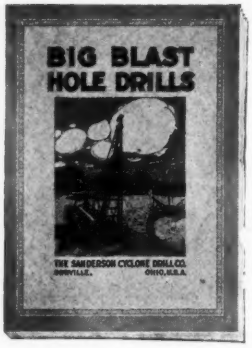

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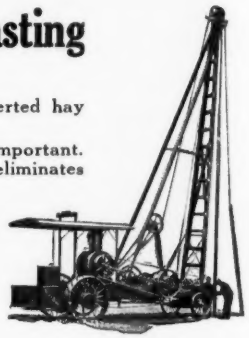

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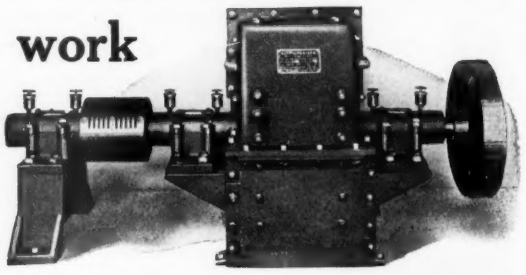

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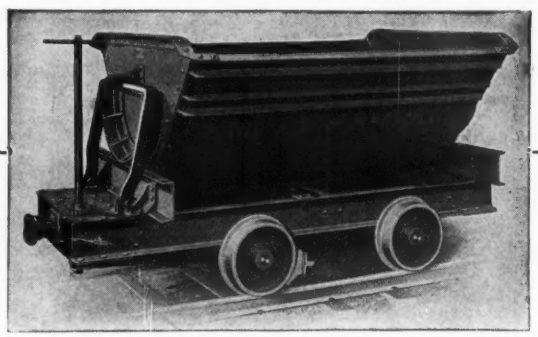

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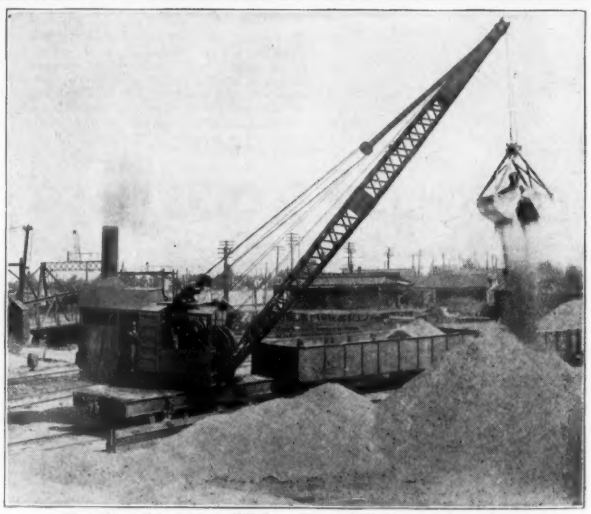

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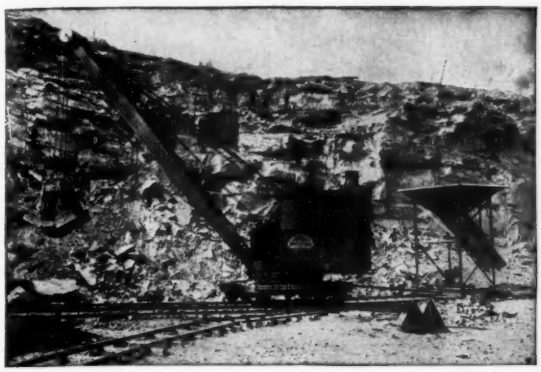

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reduce expense of handling materials and increase profits and output wherever installed. Catalog No. 18 now ready. Its valuable information will simplify your problems.

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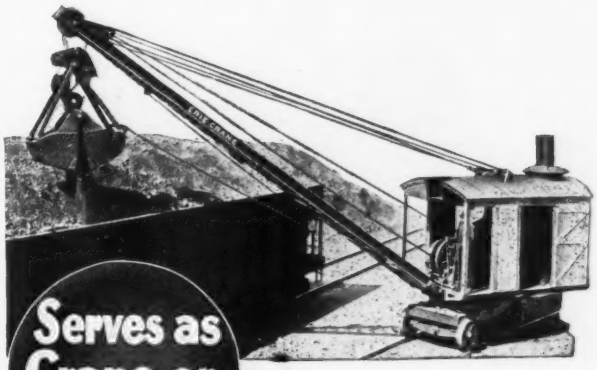

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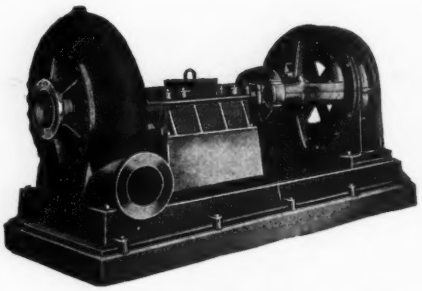

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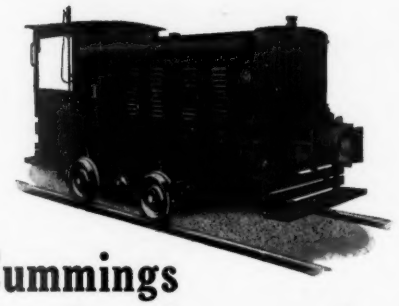

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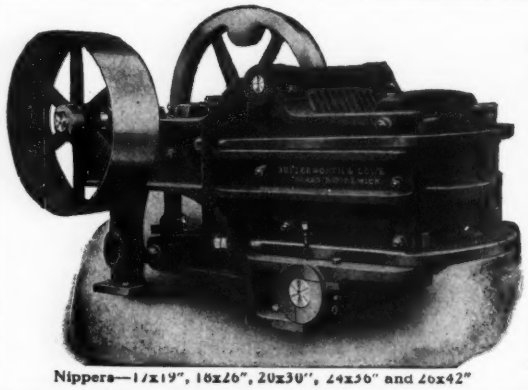

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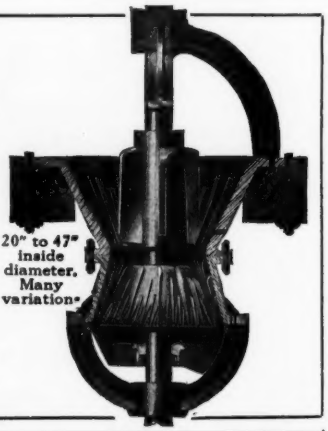

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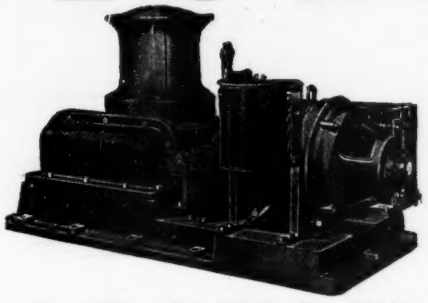

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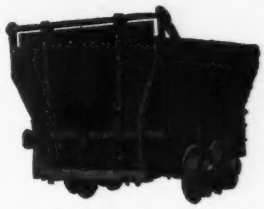

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The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

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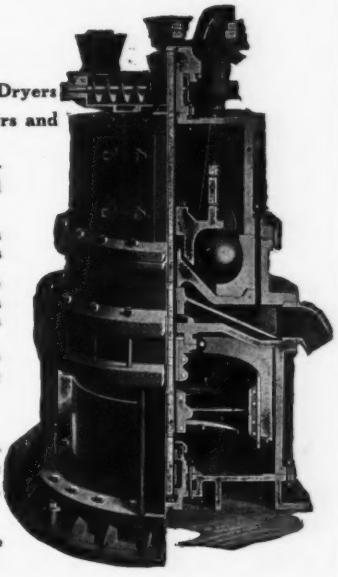

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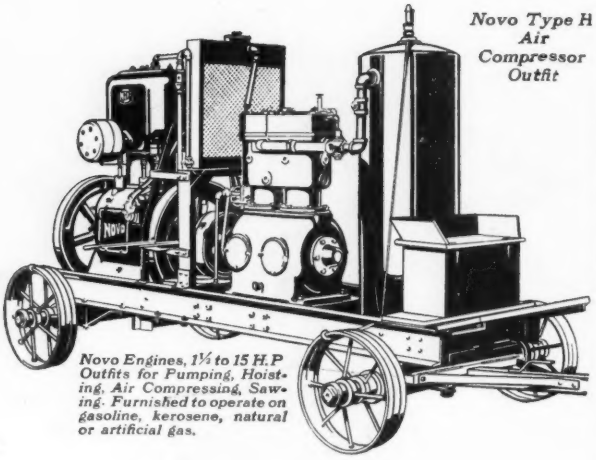

Novo Type H Air Compressor Outfit

Novo Engines, 1¼ to 15 H.P. Outfits for Pumping, Hoisting, Air Compressing, Sawing. Furnished to operate on gasoline, kerosene, natural or artificial gas.

A Two-Foot Hole in Four Minutes

For rock drilling in quarries a Novo Air Compressor Outfit will give real satisfaction. It'll carry full loads for long periods without overheating; it runs quietly, at constant speed; it is mounted on a team truck for portability; it is hung low, so the engine can be started from the ground.

The No. 174 Outfit has a 6″ x 6″ duplex conpressor operated by a 15 H.P. Novo Engine. It delivers air at a working pressure of 100 pounds—and enough air to drill a hole two feet deep in three or four minutes.

This is the largest of five Air Compressor Outfits, designed to meet the various needs of quarries and road builders. For full information regarding these outfits, write for Novo Bulletin No. 152.

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C. S. WERT—Inventor and Patentee

Turns out, with four men, 16,000 to 20,000 concrete bricks in ten hours.

In severe tests, Perfect Concrete Brick have proven stronger than common clay and pressed clay brick.

The power tamper may be operated by a one horse power motor, a 2½ horse power gas engine or direct from a line shaft.

"There is no better brick machine manufactured," says W. T. Sharp, of Montana, owner of a Perfect brick plant.

Get facts and figures now. Write while the matter is on your mind.

Latest Model, Gearless and Noiseless

Manufactured by
The Wert Mfg. Co.
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Universal Crushers

The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy! Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

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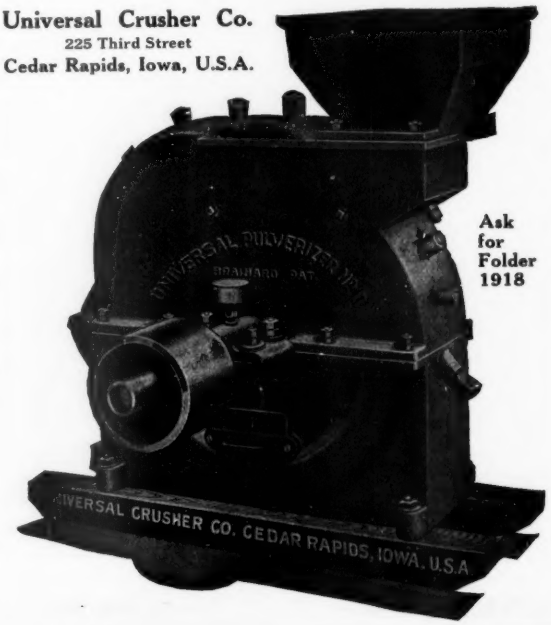

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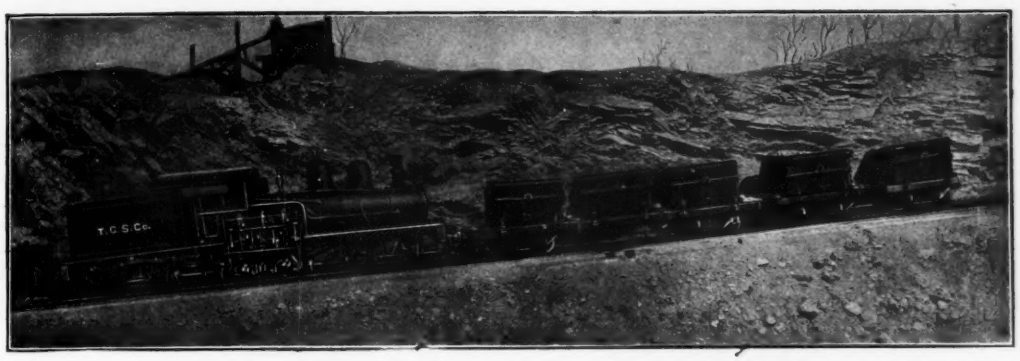

Spotting Losses

The minutes lost in spotting with a rod engine add up.
Translated into money they mean unnecessary dollars and cents in daily operating costs.
Multi-cylinders and geared drive—every wheel is a driving wheel—enable Shay Geared Locomotives to spot quickly and accurately, saving time and money in the operation.
We know because we make both rod and Shay locomotives.
Operators who use Shays know, too.

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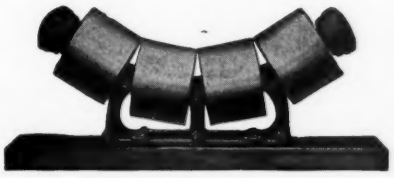
LIMA, OHIO **17 East 42nd St., New York**



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Simple—Economical

will solve your handling problem. Simple in design, economical of power, they give the utmost satisfaction. Our forty years' experience has made us thoroughly familiar with the many details of construction necessary to success.

A rough sketch showing the conditions to be met at your plant will bring our recommendations. We should also know the capacity desired and the power available.

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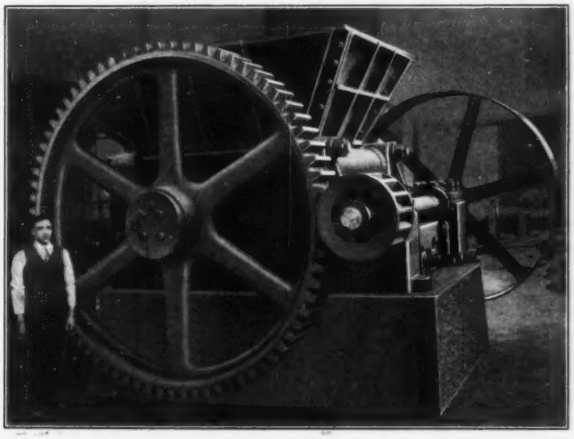
Elevating, Conveying and Power Transmitting Machinery
Chicago 17th Street and Western Avenue — 50 Church Street New York, N. Y.



If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

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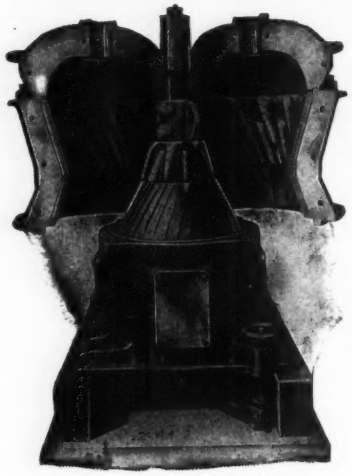
Hollidaysburg, Pa.
Screens, Elevators, Conveyors, Rock Washers, Etc.

"Open-Door" Rotary Fine Crusher

For reducing soft and moderately hard material to one-half inch and finer. For lime, gypsum, shale, clay, clinker, coal, etc., they are unequalled



"Open-Door" Rotary Fine Crusher

Unfasten the bolts, throw open the door and get at all wearing parts. One man can open the door in a very few minutes.

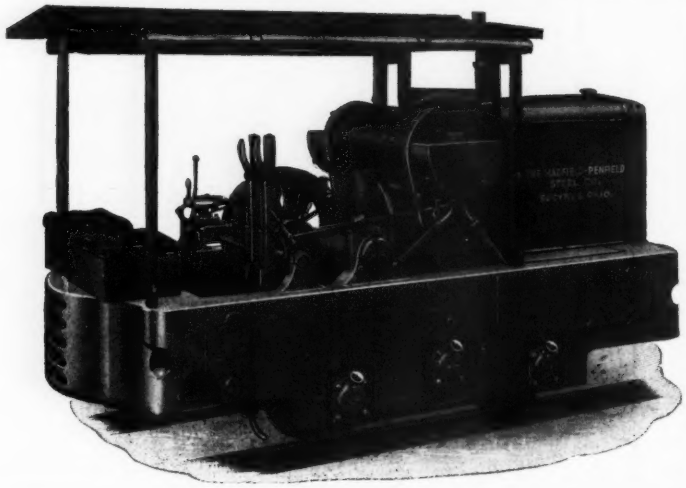
Shut-Downs Are Costly— Time Is Money

"Open-Door" machinery pays because it operates more continuously than any other, therefore production is greater and less time and labor are necessary in case of obstruction or repairs.

Built in Five Sizes

Sturtevant Mill Company **Boston, Mass.**

The AMERICAN GASOLINE LOCOMOTIVE



The American Gasoline Locomotive was designed for industrial activities where light hauling is required. It is a simple, sturdy and efficient machine that has been made as nearly fool-proof as possible. It is equipped with a Hercules Motor-Friction Drive, 4-wheel sander, 4-wheel brake.

Telescopic coupling in transmission housing. Self aligning axle and parts are accessible.

Made in several sizes, types and horsepowers.

Write for catalog with full information.

The Hadfield-Penfield Steel Co.

Bucyrus, Ohio

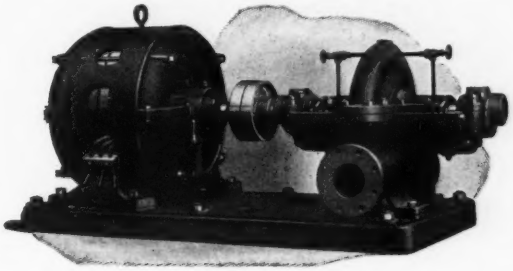
5 to 1 and worn thus

In a test on a mining locomotive, this "Tool Steel" pinion was worn thus after it had outlasted five ordinary steel pinions. During this time it saved four-tie-ups of the locomotive (valued at ???) and saved approximately $22.00 in direct pinion costs.

Tool Steel Face as hard here as on the very surface. (This is one of the great differences between tool steel and case-hardening methods)
Note the depth and uniformity of the hardened wearing surface
The toughened tooth center has far greater strength than ordinary steel
Toughened Center

The Tool Steel Gear & Pinion Co.
Cincinnati, Ohio

CENTRIFUGAL PUMPS
FOR
ROCK PRODUCTS INDUSTRIES



In rock quarries, and similar lines of work, Allis-Chalmers centrifugal pumps are rapidly becoming more widely used because they do the work well and with a margin of reliability over that actually required. One Stone Company where we supplied a multistage pump for "stripping" service writes us—"We can recommend this outfit for any quarry where the water supply is available."

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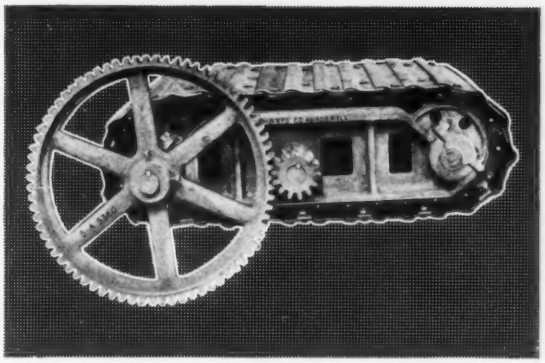

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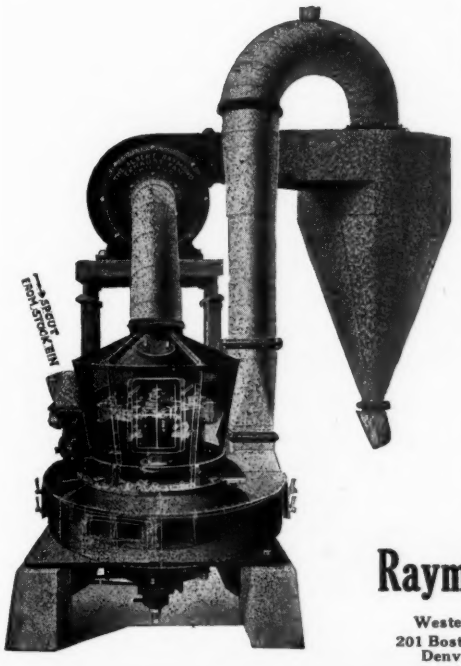
Success to the User is Inherent in the RAYMOND SYSTEM



It isn't so much the materials or workmanship which are put into a Raymond Mill, although these have a direct bearing on the success of a grinding and pulverizing unit, as it is the Personal Service which is at your beck and call at all times.

When you are in trouble or require assistance of any kind in producing the exact results you are after, a Raymond Service Man is always at your command.

Raymond Bros. Impact Pulverizer Company

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(Continued from page 62)

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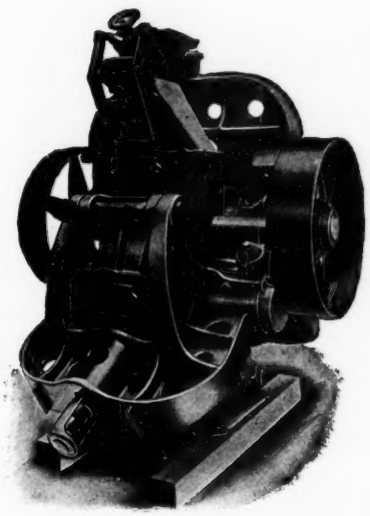

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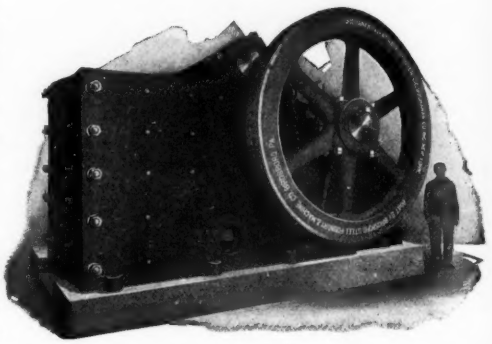

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INDEX TO ADVERTISEMENTS

Advance Engineering Co. 51
Allis-Chalmers Mfg. Co. 61
American Process Co. Inside front cover
American Steel & Wire Co. 49
Arnold & Weigel 50
Associated Business Papers 4
Atlas Car & Mfg. Co. 54

Baldwin Locomotive Works 53
Ball Engine Co. 55
Bates Valve Bag Co. 53
Blaw-Knox Co. 9
Buchanan Co., C. G. 66
Buckbee Co., J. C. 50
Butterworth & Lowe 56
Buyers' Bulletin 45
Buyers' Guide 62-64
Byers Machine Co., The 49

Caldwell & Son Co., H. W. 59
Central Frog & Switch Co. 52
Chicago Perforating Co. 52
Classified Advertising 47
Columbus-McKinnon Chain Co. 51
Cross Eng. Co. 56
Cummings Mach. Co. 56

Diamond Mfg. Co. 51

Easton Car & Construction Co. 53
Ehrsam & Sons Co., J. B. 50
Erie Steam Shovel Co. 55

Fate-Root-Heath Co. 10
Flory Mfg. Co., S. 57
Fuller Lehigh Co. 57

Glamorgan Pipe & Fdry. Co. 68
Greenstone Products Co. 55

Hadfield-Penfield Steel Co. 60
Harrington & King Perf. Co. 52
Hendrick Mfg. Co. Inside front cover
Hunt, R. W., & Co. 50

Interstate Equip. Corp. 65

Jaite Co., The Inside front cover
Jeffrey Mfg. Co., The 6

K-B Pulverizer Co., Inc. 54
Kansas City Hay Press & Tractor Co. 49
Kent Mill Co. 65
Kramer Bros. Fdy. Co. Front cover
Kritzer Co., The 53

Leschen & Sons Rope Co., A. Inside back cover
Lewistown Fdy. & Mach. Co. 52
Lima Locomotive Works 59
Link-Belt Co. Back cover

Maddox Fdy. & Mach. Co. 48
Massey Co., Geo. B. 50
McLanahan-Stone Machine Co. 59
McMyler Interstate Co. 54
Metro-Nite Co. 55
Miscampbell, H. 57
Morris Machine Works 56
Morgan Construction Co. 68
Munson Mill Mach. Co. Inside back cover
Myers Whaley Co. 52

New Holland Mach Co. Inside front cover
New York Belting & Packing Co. 1
Nortmann-Duffke Co. 48
Novo Engine Co. 58

Ohio Locomotive Crane Co. 51
Orton & Steinbrenner 55
Osgood Co., The Inside back cover
Owen Bucket Co. 49

Pennsylvania Crusher Co. Inside front cover
Porter Co., H. K. 49

Raymond Bros. Impact Pulv. Co. 63
Robins Conveying Belt Co. 51

Sanderson Cyclone Drill Co. 54
Sauerman Bros. 51
Smidth, F. L. & Co. 50
Smith Eng. Works 7
Sorgel Electric Co. 49
Steacy Schmidt Mfg. Co. Inside front cover
Stephens-Adamson Mfg. Co. 63
Stimpson Equip. Co. 49
Sturtevant Mill Co. 60

Terry Mfg. Co. 49
Toepfer & Sons Co., W. 51
Tool Steel Gear & Pinion Co. 61
Traylor Eng. & Mfg. Co. 5
Tyler Co., The, W. S. 3

Universal Crusher Co. 58
Universal Road Mach. Co. 52
Used Equipment 46-47-48

Vulcan Iron Works 8

Watt Mining Car Wheel Co. 57
Wert Mfg. Co. 58
Whitcomb Co., Geo. D. 53
Williams, C. K., & Co. 50

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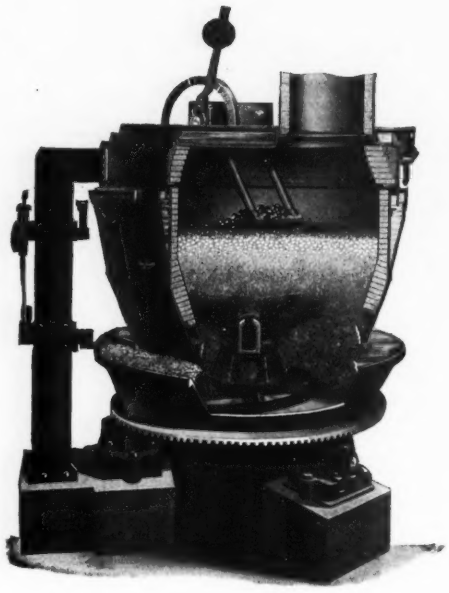

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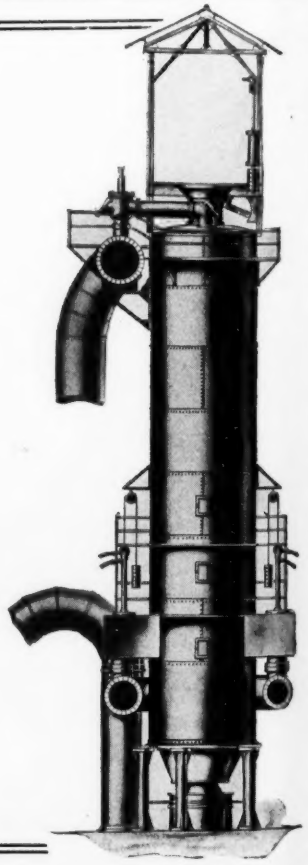

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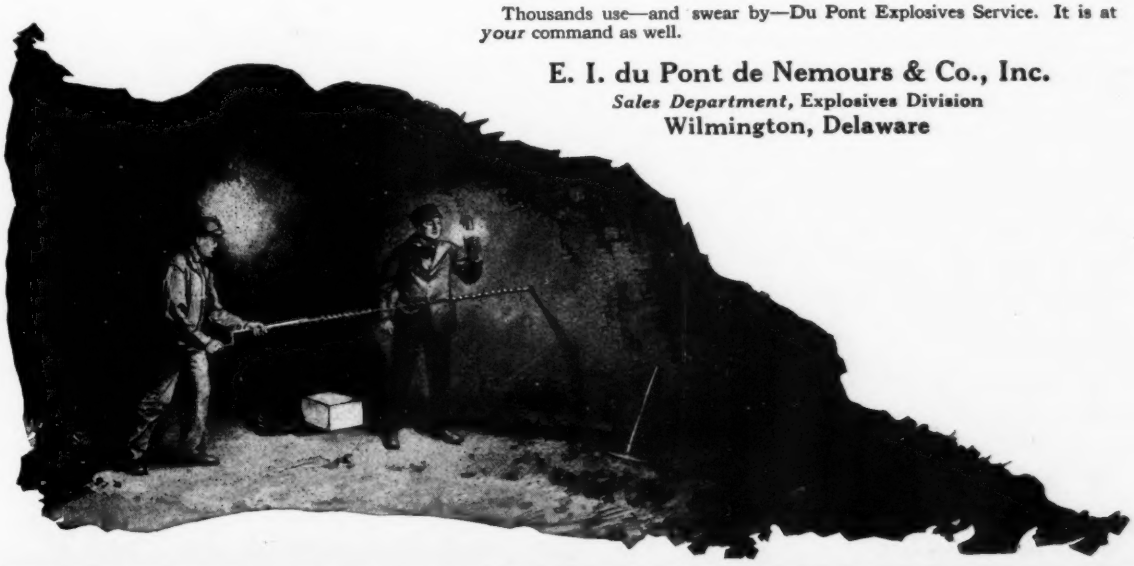
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